A CASE

12

OF

TUMOUR OF THE SPINAL CORD.

REMOVAL; RECOVERY.

BY

W. R. GOWERS, M.D., F.R.S.,

AND

VICTOR HORSLEY, B.S., F.R.S.

Read June 12th, 1888.

[*From Vol. LXXI of the 'Medico-Chirurgical Transactions,' published by the Royal Medical and Chirurgical Society of London.*]

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Received March 8th—Read June 12th, 1888.

Medical History of the Case, by Dr. Gowers.

Capt. G—, æt. 42, had good health until the year 1884. There was no history of syphilis. During 1883 and 1884 he endured much mental anxiety, and in the latter year he had a considerable mental shock—his wife was knocked down and run over in his presence, and he was able to save himself from a similar fate only by suddenly throwing himself backwards. Soon afterwards he began to suffer from a dull pain across the lower part of the back, which he thought was due to the strain of the accident. This pain passed away in the course of a few weeks and did not return. In June, 1884, he first felt a peculiar pain that was the most prominent symptom during the early part of his illness. It was localised in a spot beneath the lower part of the left scapula. This pain commenced suddenly one day while he was walking, and was continuous and severe for about a month. It was increased by active exertion and by the jolting of a carriage. Repeated examination failed to reveal any cause for it. After a time it became less, but was felt occasionally through the autumn and winter. By the spring it had all but ceased, and he was asked to go out to China on business. Before undertaking the journey he consulted a physician in London, who pronounced the pain to be an intercostal neuralgia and suggested that the voyage would probably do good. While Capt. G— was in the train, on the way to Brindisi, the pain returned in severe degree, at the same place, and of the same character. During the voyage it continued, varying in severity, but when he reached China it was so intense, and was so much increased by movement, that he could scarcely walk. A German doctor at Shanghai, after a course of Turkish baths had been tried without benefit, expressed the opinion that an aneurism was the cause of the pain. Digitalis and iodide of potassium were given, and the latter was increased to large doses by two English practitioners at Shanghai, who doubted, however, whether there was an aneurism. The pulse became curiously variable, changing from 120 in the morning to 75 in the afternoon. The pain continued, and some fainting attacks occurred, one of which was thought to be possibly epileptic in character. In October, 1885, still suffering much and very prostrate, he left China for England. During the voyage he improved in health, the faintings ceased, and the pain lessened, so that in December, 1885, he could walk a little. Walking had been interfered with only by the pain. Other physicians were consulted, and the rest of the winter was passed in the South of France. The improvement continued, and by the spring of 1886 he was so much better that he went on to Constantinople on business. While there the pain almost ceased. He returned to England in the middle of the summer, and, as the pain was still felt a little at times, he consulted other physicians and by them was sent to Aix-la-Chapelle. While he was there the pain returned in great severity and morphia was injected. In September, 1886, he returned to England, and the pain was then very severe, and, as before, was increased by movement so that he was again scarcely able to walk. The morphia was stopped and blisters applied. An aneurism was again suggested as the probable cause of the symptoms, and the use of morphia was resumed for a time, but was again discontinued at the wish of the patient himself. He became irritable; the continued pain seemed to lessen his power of self-control. So marked, indeed, was his mental state that the question was seriously raised whether he was quite sane, and whether this mysterious pain was anything like as severe as he described. He continued in this condition till the end of the year. In February, 1887, he again came to London for advice and consulted two physicians, who expressed the opinion that there was no organic disease and advised him to go abroad. During February and March there came on distinct loss of power in the legs. The left leg first became weak and a few weeks afterwards the right. In April he went abroad, and remained away from England for two months. During this time the weakness increased to complete loss of power, sensation became impaired, and the urine was retained in the bladder. Still the mental peculiarities were so conspicuous to those around him that fresh doubts were felt as to the reality of his symptoms, and it was suggested by someone that he should be put through a course of the Weir-Mitchell treatment. Before this step was taken another opinion was thought desirable, and the patient was brought to London for the purpose on June 4th. I saw him on the following day, in consultation with Dr. Percy Kidd, who was connected with the patient but had not had anything to do with the previous treatment.

The condition then presented by Captain G— was that characteristic of grave organic disease of the dorsal region of the spinal cord. There was absolute motor palsy of the legs, and cutaneous sensibility of all kinds was lost as high as the ensiform cartilage. At and just above this level, that is, in the region of the sixth and seventh intercostal nerves, he complained of severe pain around the chest, much more severe on the left side than on the right, and increased to evident agony on any movement. The legs from time to time became rigid in extensor spasm, and a clonus could be obtained with great readiness in the muscles of the calf and front of the thigh. The paroxysms of spasm involved also the muscles of the abdomen. The bladder was distended, and the urine that was drawn off contained pus. There was no irregularity of the vertebral column, nor could tenderness be discovered in any part. No trace of pulsation could be felt in its vicinity, and no murmur could be heard on auscultation. The thoracic organs seemed healthy, and both lungs were equally filled with air.

The development of complete paraplegia, which had taken place during the preceding four months, rendered the diagnosis, up to a certain point, a simple matter. The symptoms were those characteristic of a transverse lesion of the cord a little above the middle of the dorsal region. The gradual onset of the paralysis, the affection of one leg before the other, and the long-preceding signs of nerve irritation at the level of the lesion, made it practically certain that the spinal cord was damaged by compression and that the cause of the pressure was outside the cord itself. Caries of the spine was excluded by the absence of any irregularity of the spines or tenderness, taken in conjunction with the long duration of the symptoms. The diagnosis lay between an aneurism eroding the vertebræ and compressing the cord, a growth springing from the bones of the spine, and an intra-spinal tumour within the canal, but outside the cord itself. Although aneurism could not be completely excluded, the absence of any of the characteristic physical signs of aneurism, and the absence of any indication of weakening of the spinal column, made this cause of compression far less probable than one of the two others. The distinction of a tumour of the bones from one within the canal can only be a matter of certainty when the enlargement of the bones, caused by the former, can be felt. In other cases the diagnosis can only be a matter of probability, and often of very low probability. A growth backwards from the bodies of the vertebræ may cause symptoms undistinguishable from those due to a tumour springing from the membranes. In this case, however, the symptom of longest duration, the pain, pointed to irritation of the posterior roots on the left side, and therefore to a lateral position of the growth, and the affection of the left leg before the right had the same significance. A growth from the bone on one side of the cord would be more likely to cause recognisable enlargement of the parts, than would one springing from the bodies of the vertebræ, and the absence of such enlargement in this case was therefore somewhat in favour of the growth being altogether within the canal.

The course of the symptoms, coupled with the inutility of iodide of potassium, precluded the supposition that the disease was syphilitic. The long duration of the symptoms in slight degree was in favour of the non-malignant character of any growth that might exist.

In a description of tumours within the spinal canal,[1] I had previously suggested that the removal of spinal meningeal growths would be not only practicable but actually a less formidable operation than the removal of intracranial tumours. In this case the patient and his friends were exceedingly anxious that something should, if possible, be attempted. An operation gave a chance, the only chance, of cure. If the tumour should turn out to be one that could not be extirpated, it was possible that the removal of an arch, or the division of nerve-roots passing into the growth, might lessen the sufferings of the patient. If nothing were done, death after months of intense suffering was inevitable.

Sir William Jenner saw the patient with Dr. Percy Kidd and myself, and concurred in the probable diagnosis of a growth. The question of an operation was submitted to him and received his sanction, provided the patient himself clearly understood the nature of the operation and that a perfectly successful result was not more than a possibility. Capt. G— was, however, only too anxious to submit to anything that held out the faintest hope of relief. Accordingly Mr. Horsley was asked to see the patient, and, if he saw fit, to operate.

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[1] 'Manual of Diseases of the Nervous System,' vol. i, p. 432.

Surgical History of the Case, by Mr. Victor Horsley.

I saw Captain G— on the 9th of June, 1887, at 1 p.m. The patient was half sitting up, complaining of paroxysms of very great pain in the lower limbs and abdomen, the former being completely paralysed and frequently flexed in clonic spasm, the pain accompanying which was so severe as to cause the patient to cry out. On careful examination of his spine, there appeared no undue prominence of any vertebra, and the only abnormality detected was tenderness on pressure to the left side of the sixth dorsal spine. This was very constant though slight; on movement the patient complained of a sensation of weakness (rather than pain) referred to the middle of the dorsal region, but such movement did not seem to start the spasm in the legs by interference with, or pressure upon, the spinal cord. He was very loth to move because it necessitated voluntary change of position of his legs, movement of any of the joints of which was liable to bring on a severe paroxysm of painful flexion. In addition to the complete loss of motor power just noted, there was loss of tactile sensibility as high as, and involving the destruction of, the fifth dorsal nerve. There was some doubtful diminution of sensibility in the left fourth intercostal space, but this could not be satisfactorily demonstrated when I saw the patient.[1] On the right side the insensibility was limited to the fifth interspace. The anæsthesia was complete for all kinds of stimulus.

[1] This slight affection of the left fourth nerve was nevertheless of great diagnostic importance as the sequel of the operation shows (see p. 11).

There was complete loss of power over the bladder and rectum, and catheterisation had been found difficult with a metal instrument on account of the severity of the urethral spasm thus excited. (After the operation, when the spasmodic condition was equally severe, the passage of a soft rubber catheter was unattended by this trouble.)

The morning temperature during the week preceding the operation varied from 97·4° to 99·2°, and the evening temperature between 99° and 99·4°.

For the history and present state see the foregoing description by Dr. Gowers.

Operation.—June 9th, 3.30 p.m. Present: Drs. Gowers, Percy Kidd, and Edmunds. Mr. White anæsthetised the patient with ether while he was lying in the semi-prone position on the right side, and I was kindly assisted by Mr. Stedman and Mr. Ballance. The skin was shaved and thoroughly cleaned with ether and 5 per cent. carbolic acid solution, the spray was used throughout the operation, and the instruments and sponges were kept in 5 per cent. carbolic solution. Free incision was then made in the middle line through the skin and the subcutaneous tissues extending from the third dorsal spine to the seventh. The deep fascia and tendinous attachments of the muscles were then cut from the spines and a transverse cut was carried outwards from the spines over the spinous muscles through the vertebral aponeurosis, so as to prevent all tension on the sides of the wound. (See Remarks.) Vessels bled freely by the sides of, and between, the spinous processes, and were secured with Wells's forceps. The muscles were then completely detached from the spinous processes, from the laminæ, and from the mesial aspect of the transverse processes. This was done in a way which I shall refer to later, namely, by free use of the knife, and subsequently blocking the wound with sponges, while the same procedure was carried out on the other side of the spinal column. The sides of the wound being now strongly retracted and most of the vessels ligatured, the spines and laminæ could be seen perfectly.

The fourth, fifth, and sixth dorsal spines were then cut off close to their bases with powerful bone forceps, the laminal arch of the fifth vertebra was then trephined with a three quarters of an inch trephine, the pin being placed in the middle line. The bone was very hard and tough and one sixteenth of an inch thick. The rest of the laminæ were then removed with a bone forceps and knife, the ligamenta subflava giving much trouble owing to their toughness. The laminal arches of the fourth, fifth, and sixth vertebræ being thus cleared away, the dura mater was easily exposed by an incision in the middle line through the fat covering it. This fat, being pressed aside, shrank and showed the dura mater of a normal appearance, colour, and tension. Nothing very abnormal was then observed, save that on the left side the dura mater was distinctly pressed nearer to the bony wall of the neural canal. This, of course, was due to the fact that the tumour lay on the left side of the cord, and consequently pressed the dura mater on that side closer to the vertebræ. The wound being practically bloodless, the dura mater was slit open in the middle line with a knife and dissecting forceps. The cerebro-spinal fluid escaped freely, but not with any undue pressure to signify pathological tension. The spinal cord was now exposed for about two inches and appeared to be perfectly natural in colour and density; moreover, the vessels coursing on its surface were in every respect normal.

It will now be readily understood that the upper part of the roots of the sixth nerve and the whole course of the fifth nerve on each side from the spinal cord to the intravertebral foramen was completely exposed. Examination of the spinal cord on all sides with the finger and cautiously with an aneurism needle failed to reveal anything abnormal. Another lamina was removed at each end of the wound, the dura mater as before slit up, and the cord still further exposed, but still nothing pathological was discovered. At this juncture it appeared as if sufficient had been done, but I was very unwilling to leave the matter undecided, and my friend Mr. Ballance being strongly of the opinion that further exposure of the cord was indicated, I determined to go further if the state of the patient warranted me in so doing. Finding that his pulse was very strong, and that there would be no difficulty whatever in the anæsthetisation, I removed another lamina at the upper part of the incision. On opening the dura mater I saw on the left side of the subdural cavity a round, dark, bluish mass about three millimetres in diameter, resting upon the left lateral column and posterior root-zone of the spinal cord. I recognised it at once to be the lower end of a new growth, and therefore quickly cut away the major part of the lamina next above. This enabled me to see almost the whole extent of the tumour when the dura mater was divided. It was an oval or almond-shaped body of a dark, bluish-red colour, resting upon, and attached at its lower extremity to, the highest root of the left fourth dorsal nerve,[1] just where the posterior nerve-roots were gathered together in one trunk. On palpation the tumour markedly fluctuated. Above, it extended as far as the third dorsal nerve to which it appeared to be loosely attached by connective tissue, evidently a fold of the arachnoid. The tumour occupied exactly the position of the point of the ligamentum denticulatum, being jammed between the dura mater and the left side of the spinal cord. The pia mater and the arachnoidal sheath of the spinal cord evidently passed continuously from the cord over the surface of the tumour, forming a kind of capsule on its upper surface. At the same time it seemed as if the tumour could be pressed away from the spinal cord, so as to give the idea of its not actually invading the substance of the cord. I therefore made an incision through the pia matral sheath of the spinal cord, and then found that I could easily dissect the tumour from the surface of the cord, lifting it out of the deep bed which it had formed for itself in the lateral column of the cord. It was easily detached above by cutting through the loose tissue before described. Below, as it was firmly adherent to the fourth dorsal nerve, and as that nerve was of course of insignificant importance, I cut away the portion of nerve adherent to the growth. The outer border of the tumour was bathed in the cerebro-spinal fluid, and so required no dissection, but in removing the growth its inner surface, formerly of course in close contact with the cord, apparently gave way and some turbid serous fluid escaped, this reducing the volume of the tumour to about three fifths of its former size. (For description of the tumour *vide infra.*)

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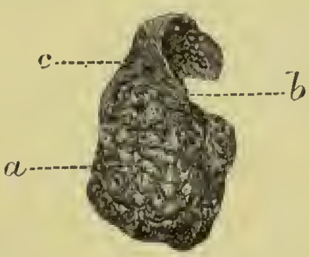
[1] The growth was found by measurement (at the operation) to be situated four inches above the level of complete anæsthesia.

The cavity left by the removal of the growth was of course for the most part simply the subdural space, but the spinal cord was evidently greatly damaged by the pressure of the growth. The lateral column was so depressed or notched, so to speak, that the bottom of the groove in it nearly reached the middle line of the cord. It seemed likely, therefore, that most of the fibres in this column would be completely destroyed, moreover, there was evidently no resiliency in the damaged cord, for during the time that it was under observation the bottom of this pit showed no tendency whatever to rise. The surrounding adhesions of loose connective tissue oozed rather freely, but gentle pressure with a fragment of sponge for a few minutes soon arrested this bleeding. The cord and subdural space was then carefully sponged with 5 per cent. carbolic acid solution and freed from blood-clot. The edges of the long incision in the dura mater were then approximated (incision fully four inches) and laid in position but not sutured at all. The few remaining vessels were ligatured, and the sides of the wound brought together by strong silk sutures passed vertically with curved needles through almost the whole thickness of the side of the wound, and at a distance of about half an inch from the border. These sutures were placed at distances of about one inch, and on being tied firmly were found to readily approximate the two sides of the cavity close to the dura mater. The edges of the skin were carefully approximated with numerous horsehair sutures, a small superficial drainage-tube was placed at the lower extremity of the wound, and a long drainage-tube was placed vertically to the dura mater and reaching so far as that membrane at the upper end of the wound. The whole was then covered with a strip of carbolic gauze dipped in 5 per cent. carbolic solution, and a carbolic gauze dressing applied. The patient was put back to bed.

The Tumour.—The growth, on microscopical examination, was found to be fibro-myxoma. It presents a nodular appearance, and the cavity referred to on p. 12 was found to be on the inferior and outer surface, being such a cystic space as might have resulted from a hæmorrhage. The wall of the cavity was found to be a false capsule derived from the pia mater and arachnoid. Unfortunately its contents were lost in the operation. The mass of the growth on section was pale and homogeneous, but indications of separation into nodular masses could be seen here and there. The tumour was enveloped, as already described, in a thin capsule, and consequently the parts will best be described under the headings of *capsule* and *substance*.



From a photograph of the tumour (natural size).

a. Points to the lobulated surface of the solid portion of the tumour, this producing the excavation of the cord.

b. Points to the open cavity in the tumour, this cavity being ruptured during the removal of the mass.

c. Shows the fibrous capsule forming part of the inner wall of the cystic cavity, and consisting of simple connective tissue, thus contrasting with the myxomatous tissue at *a.*

(1) *Capsule.*—The capsule was formed of very delicate connective tissue in which the ground substance was obviously mucinoid, and in which numerous corpuscles were

embedded. The corpuscles were (*a*) leucocytes with darkly-staining round nuclei, (*b*) connective-tissue corpuscles with feebly-staining oval nuclei. Numerous large vessels with very thin walls (those of the veins in fact showing but one or two layers of muscle-fibres at the most) coursed through the exterior of the growth.

(2) *Substance.—Stroma.*—The stroma of the growth was composed of mucinoid ground substance and trabeculæ of spindle-shaped connective-tissue corpuscles closely applied to one another.

Parenchyma.—These trabeculæ marked off round spaces, which were entirely occupied with myxomatous connective tissue, *i. e.* mucinous ground substance which shrank greatly in alcohol, and in which were numerous corpuscles of varied shape. The nuclei of the corpuscles were (*a*) round and darkly staining, (*b*) oval and slightly staining, (*c* and *d*) ellipsoidal and spindle-shaped, darkly staining, and (*e*) very elongated, also darkly staining. These latter were as long and slender as the nuclei of involuntary muscle-corpuscles.

(3) *Vessels.*—A very few vessels were visible in the substance of the growth, and there were very small arterioles and venules with delicate walls of adventitia.

(4) *Pigment.*—In very many parts of the sections numerous collections of hæmatoidin granules were visible. In some instances these were obviously in corpuscles. No signs of any recent hæmorrhage, *i. e.* within a year or two, could be found.

Further Course of the Case.[1]

June 10th, 1887, 1 a.m.—Patient restless, complaining greatly of painful spasm in the legs and bladder, with sensation of distension of latter. Urine drawn off with soft catheter. The flow of urine was of the kind characteristic of complete paralysis of the bladder. No further change. Gr. ¼ of morphia given hypodermically.

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[1] Owing to the length of the case it will be best to give as far as possible succinct *résumés* of the course of each leading symptom, &c.

9 a.m., temperature 97·6° F. (It may be stated here that the temperature throughout never reached 100° F., the highest recorded being 99·8° at 4 p.m. on June 11th, *i. e.* forty-eight hours after the operation. The temperature therefore will not be mentioned again, it being only needful to explain that its fluctuations were those of health, viz. low in the early morning and a little higher in the late afternoon.) Wound dressed, looked perfectly quiet. Tubes blocked with clot; cleared and replaced. Considerable amount of bloody serous discharge and cerebro-spinal fluid in the dressing.

On turning the patient over, a proceeding which was always difficult on account of the very severe pain in the abdomen and the left lower limb more especially, there was found an erythematous raised patch on the left side of the sacrum, but extending also across the middle line to the right side. The patch was about four inches broad and about three inches in vertical length on the left side, but only one inch on the right side. The nurse was positive that before the operation there was no such decubitus, and none was observed at the operation. This patch was immediately protected with boracic ointment spread on lint, and need not be again referred to, since it gradually disappeared, although on June 13th part of it in the centre of the gluteal fold appeared dusky, as though threatening necrosis of the skin. Fortunately it simply dried up.

11th.—Pulse 112. (The pulse varied very slightly after the operation, the rate gradually falling, thus on the 12th it was 108, on the 13th 95, and it varied between 90 and 100 till complete convalescence. Nothing was to be found to account for the high rate, except the pain. The patient still complained of much constant burning pain in abdomen, bladder, and limbs, in addition to which he suffered from violent painful spasm in the bladder and left leg especially. The left lower limb frequently flexed in spasm, but the right very rarely.

It need scarcely be stated that the indescribably excessive pain under which the patient laboured made examination of the limbs, &c., practically impossible, since the least touch excited the most violent clonic spasm, followed by tonic spasm, *i. e.* rigidity in extension, such spasm being agonisingly painful.

Urine.—Sp. gr. varied from 1024 to 1030. Strongly acid, no albumen or sugar. The urine never altered throughout, save a little in specific gravity, and therefore will also not be again referred to.

12th.—Wound dressed, uniting by first intention, though the edges looked reddish.[1] Discharge slightly serous, but enormous quantities of cerebro-spinal fluid escaped. The smaller (*i. e.* the lower) drainage-tube was removed, the higher left in. (This was an error; the tube should always be left out on the second day, so as to prevent the formation of a sinus along which the cerebro-spinal fluid by escaping may cause serious annoyance.)

13th.—The patient still complained of the incessant pain keeping him without sleep. Hypodermic injections of morphia in half-grain doses only gave half-hour snatches of troubled sleep, therefore draughts of chloral and bromide of potassium were given (Hyd. Chlor. gr. xv, Pot. Brom. gr. xc in the twenty-four hours, and these were continued in gradually diminishing quantities during the succeeding weeks until about the end of September).

The bowels being constipated, an enema was given with result. The urine was drawn off whenever the patient felt it distend the bladder, *i. e.* about every six hours, and when the amount of urine was usually seven ounces. It is important to note that the patient said that the distension of the bladder increased the spasm of the abdominal muscles. This spasm was tonic and never (?) relaxed until some two months after the operation.

14th.—Wound dressed, union still perfect. Dressing soaked, but this was less marked than on the 12th inst. At 6 p.m. this day, *i. e.* on the fifth day after the operation, patient passed seven ounces of urine, and again at 9.30 p.m. six ounces. The micturition, however, was not "voluntary," but purely reflex action of the just recovered lumbar centre. The patient did not know when the urine escaped, although sensation was returning.

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[1] I have noticed this reddish colour of the edges and suture holes in another case where the cerebro-spinal fluid rendered the wound sodden, but in which nevertheless union also occurred by the first intention.

15th.—Sensation to touch now rapidly recovering, only the left foot being still anæsthetic. On account of the severe pain of the spasms excited by touching the limbs no further observations were made, *i. e.* as to transmission of painful impressions, of heat and cold, &c., but there is little doubt that as regards tactile and painful stimuli, sensation had returned by about the tenth day after the operation. There remained for some time a subjective sensation of heat in the left lower limb especially. Wound dressed; the remaining (the upper) drainage-tube was removed. The last time the catheter was used was 5 p.m. this day, the patient passing urine afterwards about ten times in the twenty-four hours, and about four ounces on the average each time, the rare extremes being two ounces and eight ounces.

On the 23rd, *i. e.* fourteen days after the operation, the frequency of micturition had diminished to six times in the twenty-four hours, *i. e.* normal. The constant pain was very severe and at times became excruciating, in fact the patient thought it was worse than before the operation.

16th.—The spasms by this day had gradually become restricted to the left side and lower limb, except when very severe. The cerebro-spinal fluid continued to ooze in considerable quantity through the small track of the upper drainage-tube.

22nd.—The patient steadily improved, the appetite returning, &c. This day he for the first time distinctly moved the right lower limb at the hip by "voluntary effort." On this occasion and also when (see below) the patient moved his left lower limb for the first time, he regarded the movement as only a spasm and not purposive, the muscular sense from disuse (?) being apparently deficient. (I have noted the same phenomenon in a case recently under my care in which release by trephining of pressure on the spinal cord restored movement in the paralysed limbs.) The recovery of power spread down the limb to the foot.

At this time, however, the pain was still excessively severe at times, but was more paroxysmal, which was regarded, and rightly, as a favorable change.

July 20th.—About this date motor power returned in the left lower limb in the same manner as in the right limb, *i. e.* from the hip downwards. It is impossible to fix the date of this recovery as it was suspected for several days before the 20th, but the effort or initial spasm marred the observation, no aid forthcoming from the patient's sensations for the reason given above.

Further, the flow of cerebro-spinal fluid gradually diminished and ceased about six weeks after the operation. The arrest was aided by pressure with a pad of gauze and boracic acid over the sinus opening.

In this state, *i. e.* with recovered control of bladder and rectum, and with motion and sensation in the paralysed limbs, the patient was sent to the seaside on August 13th, 1887. The pain had gradually diminished and was confined to the left side.

A jacket consisting of a steel pelvic band from which shoulder crutches took origin, was applied to prevent possible kyphosis and to protect the cicatrix.[1]

Nov. 17th.—In answer to queries the patient wrote on this date, "I think I am making good progress. I take a daily turn in the garden with the aid of a couple of sticks, and also a daily drive for an hour. My back and legs are still very weak and at night I suffer a good bit of pain[2] and my sleep is broken, but I am in all respects much better. Though I walk with difficulty the movement of my legs is natural and tends to get better every day." At this time as from the end of July the legs were passively moved and rubbed.

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[1] The state of the cicatrix is shown in Plate III.

[2] The pain was always worse at night, and for some time before it disappeared had but very rarely occurred in the day.

Jan. 24th, 1888.—This day the patient kindly allowed the members of the Society to inspect his back, &c. The only important point noticeable now in his condition was the character of the gait, which resembled that of a man rather stiff from fatigue. He could walk three miles with ease. The scar was very firm and indeed of almost bony hardness in the site of the fifth dorsal spine and arch. The patient was practically quite free from pain and discomfort and had very greatly increased in weight and muscular development.

Feb. 21st.—Seen again to-day; the patient's rapid progress continues, the gait is notably more free and natural than when last noted. Patient about to resume his professional work.

June 6th.—Letter received this day from patient states that he is in excellent health, of which the best evidence is that he recently did a sixteen hours day's work, including much standing and walking about.

Remarks.—This being the first case in which a tumour involving the spinal cord has been exposed and removed, it is very advisable that a full explanation should be given of the reasons which led to the adoption of the surgical procedure above described, and I think at the same time it is worth while to look back over the literature on the subject of tumours of the membranes of the spinal cord, and to see what light may thereby be thrown on this subject.

Method of Operating.

The operation of trephining the spine has been of course known to surgery since it was suggested by Heister. It has, however, hitherto been discussed with reference to cases of injuries of the spinal column.[1]

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[1] It may be interesting here to reproduce Heister's suggestion. He says ('General System of Surgery,' 6th edit., 1757, p. 140), "But to offer the patient no assistance because we despair would seem cruel and uncharitable, therefore we must try our skill though our attempts should be in vain; in

Since it was suggested, this operation has been performed, according to 'Erichsen's Surgery,' about thirty times. Before discussing its employment in these cases it must be stated that ever since it was proposed this operation has met with the greatest opposition from some surgeons for various reasons, principally no doubt because it was performed first in the prescientific epoch of surgery, *i. e.* before the introduction of antiseptic principles by Sir Joseph Lister, and consequently it obtained much of its evil reputation from the frequency with which septic infection followed the exposure of the dura mater and the subdural space. But it has also been discarded by some on account apparently of difficulties, &c., in its performance, and in fact it is regarded by some as a very difficult as well as dangerous operation. For instance, Mr. Herbert Page, in Heath's 'Directory of Surgery,' page 134, 1881, referring to the treatment of fractures of the spine, says, "The operation of trephining the spine, proposed many years ago and adopted several times, has made no progress in surgery, nor is it likely to do so . . . . It is an operation not within the range of practical surgery." In expressing this opinion Mr. Page has no doubt been influenced by the difficulties and dangers before referred to, but I would submit that they have no real existence.

Mr. Erichsen, in the last edition of his 'Surgery,' says, "The operation is not necessarily dangerous, it does not appear often to have hastened death, and has certainly in some cases afforded relief." With regard to the latter point I will discuss that when reviewing the cases I have succeeded in collecting, and I think a description of the mode of operating that I have adopted will show more briefly than anything else the way in which many of the so-called objections to the operation may be removed. In the first place the operation has been generally objected to on account of:

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order to which the surgeon must lay bare the fractured vertebræ with a scalpel and replace or else remove such fragments as injured the spinal marrow."

1. Hæmorrhage.
2. Difficulty in clearing the neural canal.
3. Physical difficulties of treating the fractured vertebræ.
4. The hopeless nature of the damage of the spinal cord.
5. Septic infection.

Of these objections we may with advantage consider Nos. 1, 2, and 3 together. In the course of some experiments upon the spinal cord, which are fully detailed in 'Brain,' vol. ix, 1886, I found that the mode of operating upon the spine for complete exposure of the bones as given in the text-books, namely, by removing the muscles from the bones by means of a blunt instrument, so far from being the best means for preventing hæmorrhage, is the easiest way of producing it. The knife must be freely and rapidly used while the soft parts are strongly retracted. It must be noted here that in every case I have found it necessary to divide the deep fascia, not only along the spinous processes, but also at right angles opposite the middle of the incision in order to prevent it resisting proper separation of the sides of the wound, indeed, it may in some extreme cases be found necessary to divide the vertebral aponeurosis at more places than one. It need hardly be added that this division of the fascia has no influence upon the rapid healing of the wound. The free bleeding which follows the separation of the muscles from the bone is best met by seizing what bleeding points can be seen with Wells's forceps and then tightly and quickly packing the incision on one side of the spine with dry sponges while the operation is proceeded with elsewhere. In this way very free oozing may be arrested in a few minutes, and the time spent in waiting for it to stop is certainly not lost, because the subsequent division of the bones can only be properly carried out when the wound is perfectly dry, as it is when the above-mentioned method has been followed. The periosteum is best reflected, without impairing its vitality, by scraping the bones with a suitably curved elevator after the mass of muscle has been turned aside.

Next with regard to the removal of the laminæ of the vertebræ. If, of course, there is a fracture of the laminæ or of the spine it will be detected at once by seizing the bones individually in strong forceps and shaking them (Erichsen), the fragment being easily extracted by dividing with a knife the ligamentous attachment, and no damage will be done to any important part if the edge be directed towards the bone. If now, however, the spine be perfectly uninjured, as in the foregoing case, it becomes a matter of great interest as to how we may most quickly remove the bones. From numerous experiments on dogs I have adopted the following method : The spinous processes of the vertebræ whose laminæ are to be removed are cut through close to their base by very powerful bone forceps. This is readily done in a few seconds and we then have the laminæ forming a continuous if irregular plate, and this can be perforated with a trephine with the usual precautions. The trephine should be almost as large as the diameter of the neural canal, this of course varying with the region operated on, the age of the patient, &c. If more than one arch is to be removed it will be better, by means of an angular saw, to partly cut through the laminæ along the lines of the sides of the neural canal, and then the division of the bones can be completed with a bone forceps.

As in all these cases the wound cavity is necessarily deep, its walls steep, and relatively very unyielding, I have devised a form of bone forceps suitable for this stage of the operation. They simply consist of two ordinary bone forceps cutting blades set at an angle of about 120° to two short arms, which meet at the hinge and which are continuous with the ordinary long handles, the whole being bent at the hinge in a sharp curve, so that they can be employed to cut horizontally at the bottom of the cavity. More difficult than the incision of the bone is the removal of the ligamenta subflava. These can only be quickly and safely got rid of by steadily cutting with a sharp knife. After removal of the bone, as is well known, we find the dura mater covered with very vascular fat of a peculiar nature. This fat and loose connective tissue, if not treated in the way about to be described, may be very troublesome indeed in causing free oozing of blood, and at the same time owing to its elasticity in obscuring the proper view of the dura mater. The numerous vessels supplying it of course come from the spinal arteries and the vertebral plexus of veins. Consequently, these are best avoided by keeping the incision in the fat strictly to the middle line. When this is done there will be very little bleeding at all, but at the same time the dura mater is completely covered by the fat. It can, however, be practically completely got rid of from the field of operation if it be retracted with broad retractors, and pressed against the sides of the neural canal for a few minutes or seconds while the dura mater is opened. This fatty tissue being very spongy seems to shrink under the pressure and remains practically out of sight during the remainder of the operation.

The next point to be considered is the treatment of the dura mater, &c. The dura mater, if opened in the middle line, will be found to admit of quite sufficient retraction to either side to expose the whole spinal cord and the subdural space. If of course the longitudinal incision in it be very short, say less than half an inch, it will be necessary to make a transverse incision as well in order to expose the whole breadth of the subdural region. But, as in the present instance, if incision be at all long, it is quite sufficient to restrict it to the middle line.

The next practical point is the escape of the cerebral fluid since on the first opening of the dura mater the cerebro-spinal fluid wells up very freely indeed, fills the wound and prevents anything like accurate handling of the spinal cord. The best course to pursue is to keep mopping it out of the wound cavity with a sponge so long as it flows. If the patient be not moved and if the spine be horizontal and the head not raised, the flow of fluid will soon cease, and the spinal cord then becomes freely visible. After inspection the spinal cord should be examined very gently by palpation, it being pressed against the bodies of the vertebræ in front, so as to reveal any change in its density. If it be suspected that some fragments of bone or a new growth may be pressing against the anterior surface of the cord from one of the vertebræ, it can best be detected by carefully passing an aneurism needle around the side of the cord, and exploring this aspect of it. In mentioning of course the opening of the dura mater, the escape of fluid, &c., due care will be taken to notice in the first place whether the dura mater is of normal appearance and whether there is any indication of its being inflamed or distended. It need hardly be stated here that of course if there is hæmorrhage beneath it it will appear dark, if pus yellow, &c. In cases where the theca is pressed backwards against the laminal arches, either from old traumatism or caries, &c., great care must be taken in perforating the laminæ with the trephine, but still more in raising the bone from the theca, for in such cases the dura is adherent to the anterior surface of the laminæ by firm fibrous adhesions, these requiring division with the knife.

A more difficult question, and one which requires experimental investigation at the present time, is the problem under what circumstances it is advisable to suture the incision in the dura mater or to leave it open. In the foregoing case, although the incision was relatively of very great extent, it was left open, but there can be little doubt that the union of the wound at the bottom of the uppermost drainage-tube canal would have been much more rapid if the dura mater had been even imperfectly closed by fine sutures.[1] There is another point which seems to me to be of practical interest, even if its existence be only theoretical. This is the possible cicatricial adhesion of the floor of the wound to the posterior surface of the dura and cord, and to the posterior roots of the nerves entering the same.

It has been long known to physiologists since the researches of Schiff in 1851, that the posterior columns of the cord are conductors of painful impressions, and this can be demonstrated on an animal which is completely narcotised with ether, so as to prevent the appreciation of pain, in the following manner. If in such an animal the various columns of the spinal cord be successively touched with a sharp point or other mechanical irritant, no reflex, *i. e.* involuntary, movements will result, except when the posterior columns are touched. This fact, as well as another mentioned below, is worthy of notice, inasmuch as it makes a high degree of narcotisation necessary for the performance of the operation under the best possible conditions. The other fact I now refer to is the sensibility of the dura mater. It is not apparently generally known that the spinal dura mater is an exceedingly sensitive membrane. In the dog this is particularly noticeable, and even in an animal perfectly narcotised with ether, reflex movements will occasionally occur when this membrane, like the posterior columns of the spinal cord, is mechanically irritated. It is very necessary, therefore, that when the dura mater is about to be seized in forceps with the view of opening it, or when similarly any delicate incision is to be made in it or into the neighbourhood of the posterior column of the cord, that the patient should be very deeply under the influence of the anæsthetic to prevent any unconscious reflex start, which might lead to very unfortunate results.

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[1] I have since sutured it with success.

To return, it will be readily understood now that possibly as before stated the wide cicatrisation together of the floor of the wound, the dura mater and the posterior roots of the nerves might produce adhesion which would cause pain if the spine were freely moved. This, however, after all may be purely imaginary since in the present case, where all these conditions must exist, the pain which occurred after the operation was not attributable to this condition, since in the first place it was merely a continuation of that which the patient endured before the operation and moreover has now disappeared.

4. *The hopeless nature of the damage of the spinal cord.*

The consideration of this part of the subject is important of course only in those instances where the cord is diagnosed to be completely softened or where the operation is undertaken for the purpose of relieving the results of fracture of the spine, the whole bearing of which we may very properly now consider. I am the more anxious to do so since I can make my meaning clearer by referring to a case of Dr. Buzzard's, in which I performed the operation last summer. The patient had fallen down a quarry and was sent up from Derbyshire to the National Hospital for the Paralysed and Epileptic in a very critical condition. There was absolute paraplegia as regards movement and sensation together with complete loss of control over the bladder and rectum. The urine was already alkaline and contained muco-pus. But the worst feature in the case was the existence of very severe and acute decubitus. Thus there was a large spreading sore over the whole breadth of the sacrum, extending especially deeply on the left side, sores over both heels, and a bleb on the left thigh.

It was very clear indeed to Dr. Buzzard and myself that unless the man was relieved from the most urgent symptoms he must speedily die. Examination of the spine showed that the spinous process of the eleventh dorsal vertebra was apparently broader than natural and a little more prominent, and at the same time very distinctly tender, in addition to which the patient very distinctly referred to this region as being the source of his weakness.

It was therefore decided to explore the seat of the fracture and if possible to remove any portion of the bone which might be pressing upon the spinal cord. The patient being placed in a prone position, and anæsthetised with chloroform, a longitudinal incision was made over the prominent vertebra. The soft parts, as before detailed, reflected, and then on grasping the spine of the eleventh dorsal vertebra it was found to be movable, but jammed forwards between the vertebræ above and below it. It was therefore seized in lion forceps and removed by cutting all the ligamentous bands attached to it. When it was extracted it was evident that the posterior surface of the dura-matral sheath was pressed backwards against the laminæ of the tenth vertebra. This therefore was also removed. The dura mater appeared perfectly normal. The theca therefore was not opened posteriorly, but on exploring its anterior surface and the bodies of the vertebræ with an aneurism needle a small puncture was made into it from which there escaped perfectly normal cerebro-spinal fluid. There was no evidence of any previous severe compression of the dura mater or its contents, and no evidence of hæmorrhage into the same. The wound was therefore closed and a drainage-tube placed opposite its middle; it was dressed strictly antiseptically. The further progress of the case was one of much interest; although the operation made no difference whatever in the motor paralysis and only slightly improved the sensory paralysis, it completely arrested the acute decubitus, the sores ultimately healing firmly, and what is still more interesting, from the time of the operation the urine became acid.

The drainage-tube was removed on the second day and the wound was completely healed at the end of seven days without a trace of suppuration.

In this case no doubt the spinal cord was momentarily jammed at the time of the accident so severely as to practically, *i.e.* functionally divide it. Though laminæ were found compressing it at the time of operation, nevertheless they did not do so so severely as to thereby alone cause the excessive degree of the symptoms, therefore it would seem that the cord, as suggested, must have been compressed at the time of the accident. Now, this is just a case in which if any attention had been paid to the ruling before quoted, the patient's life would have been lost, and indeed it must be obvious that, considering the necessarily small amount of information on this subject, it should be our duty to operate in every case, since we may possibly do some good, and certainly, if proper antiseptic precautions be taken, we can, to use Mr. Erichsen's words, do no harm. This question of the damage to the spinal cord not appearing to discount the possible benefit of surgical interference so much as has been hitherto expected, gains additional illustration from the case which forms the subject of this paper, since nothing could well have appeared more hopeless than the indentation of the spinal cord produced by the tumour. This indentation appeared to divide the lateral column completely, and yet, owing doubtless to the gradual character of the compression, the restoration of motor and sensory function has been complete. I would repeat therefore that, so far from its being unjustifiable to operate on the spine owing to the possibility of the cord being hopelessly damaged, it seems to me to be criminal not to operate.[1]

5. *Septic infection.*

The possibility of septic injection following this operative procedure is of course exactly the same as that which attends any surgical interference, and needs only to be guarded against in precisely the same way, namely, by the Listerian principles of antiseptic surgery. No special liability to septic infection attends wounds in the region of the vertebræ, though of course the subdural space is undoubtedly an unusually favorable nidus for the organisms of putrefaction. As, however, I have repeatedly urged in discussing the surgery of the cranial cavity, this danger can be removed by the use of powerful disinfectants in a strong solution, *e. g.* 5 per cent. carbolic acid solution, &c., by irrigation of the wound during the operation, and this irrigation is afforded with the least inconvenience by the spray. The drainage of the wound is so extremely easy since the patient usually lies supine, that it can be completely provided for by a drainage-tube kept in for not more than forty-eight hours.

Summing up therefore, I think I have shown reason for regarding the operation of trephining the spine as a comparatively easy one, safe and justifiable, and that its reputed dangers are no more than those incidental to all wounds, the only peculiarity being the fact that septic meningitis is practically a fatal accident, the avoidance of which, however, is well understood and provided for in 999 cases out of 1000.

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[1] Since this was written I have trephined the spine in two more instances, in both the wound healing without any complication whatever ; one, a fracture: the other a case of complete paralysis of all four limbs, &c., from severe caries of the second and third cervical vertebræ is now rapidly regaining power, being able to move both legs on the eighth day after operation, and the upper limbs later.

We will therefore pass on to the review of the similar cases collected in the accompanying table.

Tumours of the membranes of the spinal cord.—I have been able, by referring to text-books and journals, to find accounts of fifty-eight cases, which I have arranged in the following table, which does not pretend to be exhaustive but I hope is sufficiently illustrative of the subject to warrant the conclusions which terminate this communication.

In this Table the facts relative to each case, so far as they have been recorded, I have arranged under headings which seemed to indicate the salient points upon which our future information must necessarily be full to admit of our making a correct diagnosis. Unfortunately, as will be seen, even the most fully recorded cases do not admit of close contrast one with another, owing in the vast majority of instances to the fact that their real nature was wholly unforeseen. Hence it may be well at some future time to draw attention to one or two points in comparative diagnosis, which need a more complete elucidation than is apparently forthcoming from the clinical records at our disposal. Especially is this required for cases where the active source of pressure is a parasitic cyst, and which, therefore, can only be treated by surgical operation. A collection of such cases has recently been made by Dr. Maguire, to whose paper in 'Brain,' January, 1888, p. 451, reference must be made for details, but I have inserted a few cases in the table by way of comparison.

The special want of information will be seen at once in the summary of the facts detailed in the Table, and in the history of the case, the subject of this paper.

The summary of the facts in the Table will be best arranged in the order of the headings to each column as follows :

Column 2. *a. Age.*

Among the preliminary facts, the age of the patient, the subject of any of the diseases included in the table, is of course an important matter, since it will give aid sometimes in the diagnosis of the nature of the growth.

A.—Extradural Growths.

1. *Lipoma.*—It is interesting to note that in the four cases of lipoma the extremes of the ages were 10 months and 4 years respectively, the average being 2½ years. Since the nearest approach to this age is to be found under the heading of intradural tubercle (see below), it is evident that if we have presented to us a patient of such an early age with symptoms of compression of the spinal cord, the assumption that the growth is lipoma will be very strong indeed. For further discussion of this important point see 'Nature of the Growth,' Column 24.

2. *Sarcoma.*—The kind of tumour which occurs next in the order of age is sarcoma, the average age of the patients being 18 years.

3. *Echinococcus.*—Next to this sarcoma is echinococcus (of course almost invariably extradural in any case), which attacks patients of an average age of 34 years (possibly less).

4. *Tubercle.*—It is interesting to find that tubercular mischief outside the spine causing fatal compression of the cord, apparently occurs in patients of an average age of 39 years. I say apparently because the fatal cases are not numerous, whereas of course we frequently see non-fatal instances of pressure of the cord from extradural tubercular disease, usually spinal caries, in children.

The foregoing are the commonest forms of extradural disease. The rarer, such as scirrhus or myxoma, occur beyond middle life, at 48 and 53 years in the table, as of course would be anticipated.

B. Intradural Growths.

1. *Myxoma.*—Included under this heading are pure myxoma, myxomata in which there is a considerable amount of fibrous tissue, and which therefore might by some be considered worthy to be put into a separate class entitled *Myxofibroma,* and lastly cases[1] in which no diagnosis is given, but which, nevertheless, from the description, are evidently of a similar nature. Under any circumstances the cases of undoubted myxoma outnumber the instances of any other kind of intradural growth. In a total of eleven cases the extremes of ages were 19 and 60 respectively, the resultant average being just over 43 years of age.

2. *Fibroma.*—At almost exactly the same age as myxoma, fibroma occurs; thus the average of the six cases was 44 years.

3. *Sarcoma.*—Similarly, sarcoma is noted to occur at the average age of 41 years.

4. *Psammoma.*—Contrasted with the foregoing tumours of youth and middle life on the average is psammoma. This growth, which has been recognised for many years as epitheliomatous, it is instructive to see occurs at an average age of 51 years. This is in harmony with the general facts recorded of the ages at which any of these neoplasms are likely to arise.

5. *Tubercle.*—One disease alone remains for special notice, namely, tubercle, which in its intradural form was found present on an average at the age of 18·5 years. Reference to the extradural form will show that that occurred most commonly at 39 years, due reservation being made as already stated. For general purposes, however, we may conclude that if we have evidence of an intradural growth in a person beyond 30 years of age, it is almost certainly not tubercle.

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[1] As will be pointed out later, it seems likely that the results of traumatic hæmorrhage are included in this class.

Column 2. *b. Sex.*

Of the total number of fifty-seven cases the sex is recorded in fifty-four, of which twenty-four were males and thirty females.

The preponderance of the female sex is the attribute of the intradural growths as contrasted with the extradural. Thus, in the former class of thirty-six cases fourteen were male and twenty-two female, while of the latter class of eighteen cases ten were male and eight female.

Why the female sex should more especially suffer is not easy to see. If the views expressed further respecting traumatism are correct, then the difficulty will be in a measure removed, for in the course of parturition we have an obvious source of intraspinal traumatic lesion.

This subject, however interesting, scarcely in our present knowledge admits of further profitable discussion; we will therefore pass on to consider the next point, viz. the alleged cause of the disease in each case.

Column 3. *Alleged Cause.*

The discovery of a cause of the appearance of a new growth is in most cases a matter of considerable difficulty, and the origin of intraspinal mischief especially. It will, however, appear that some forms of new growth, either without or within the theca, do in their minute structure clearly suggest their mode of origin and source.

A. EXTRADURAL GROWTHS.

1. *Lipoma.*—In three of the four cases in the Table the fourth case probably supplies the clue, viz. congenital abnormality. The fat, which normally occupies much of the space between the theca and the neural canal, is highly vascular, and can easily be understood to occasionally take on a hypertrophic condition, which would lead to the fatal issue.

2. *Sarcoma.*—In three of the five cases to which a cause is assigned, we find it asserted to have been respectively "fall on the back," "exposure to cold," and secondary to primary disease elsewhere. I will return to the two former of these in summing up.

The causation of the remaining diseases does not call for special notice, owing to their pathology being known, with the exception of fibro-chondro-lipoma, in which again exposure to cold is alleged as the probable cause of the origin of the tumour.

B. Intradural Growths.

1. *Myxoma.*—Of the eleven instances of this tumour, cause is assigned in seven cases as follows:

Traumatism	2 cases.
Exposure to cold	2 cases.
Parturition	1 case.
Suppression of menses	1 case.
Fright	1 case.

Possibly we should associate the third alleged cause with the first, and the fourth with the second.

2. *Fibroma.*—Of seven cases in which cause is alleged it is described as follows:

Exposure to cold	3 cases.
Traumatism	2 cases.
Chlorosis	1 case.
Fatigue	1 case.

3. *Sarcoma.*—For this growth we find:

Exposure to cold	2 cases.
Traumatism	1 case.
Fit of anger	1 case.

4. *Psammoma.*—Cause given only once. Stated to have come on soon after parturition. ? Traumatism.

The other intradural conditions, such as tubercle, parasites, &c., require no description.

On addition of all the alleged causes of both extra- and intradural growths we find them to stand as follows:

Exposure to cold	8 cases.
Traumatism	8 cases.
Mental shock	2 cases.
Chlorosis	1 case.
Fatigue	1 case.
Congenital	1 ? 4.

Considering that these alleged causes are given for only thirty-five[1] instances of disease, it is very remarkable that in almost one half of the total number of the cases thus recorded the cause should either be attributed to traumatism or exposure to cold, and this fact is of course greatly strengthened by consideration of the whole number of twenty-one alleged causes no less than sixteen are ascribed to these excitants. To this must be added certain facts from the histories of the cases, which are but briefly alluded to in the Tables. Thus, in several instances of the traumatism and in many instances of exposure to cold, the leading and earliest symptom, *i. e.* pain ,was noted to commence directly after the sufferance of the alleged cause. But more than that. We have, I think, direct evidence on this point of a more valuable kind, viz. that afforded by anatomical investigation, whilst if from the table we extract the eight cases of traumatic origin, we shall find that three must be put aside because the tumour was solid, or because not sufficient facts were known about it to enable us to express an opinion bearing upon the question at issue. Of the remaining five, in two the symptoms were observed to follow directly upon the injury, so there is no question as to the real relation existing in them between the supposed cause and effect. These two cases are Nos. 24 and 44, and though classified according to the diagnosis as myxoma and fibroma respectively they are indubitably cystic formations so commonly set up by traumatic hæmorrhages in the membranes of the central nervous system. The records make this point perfectly clear, especially in Case 44, where the altered blood pigment is clearly described.

[1] The origin of the remaining twenty-three being known, *e. g.* tubercle, &c.

Passing now to Cases 46 and 32. In each I have had the opportunity of microscopically investigating the growth very thoroughly, and in each I have found scattered through the whole growth numerous collections of hæmatoidin granules, in many cases enclosed in corpuscles, as is so frequently seen in the neighbourhood of old extravasations of blood. At the same time there were no evidences whatever of recent hæmorrhages into the tumour substance such as occur in myxomata. Case 28, also classified as myxoma from its remarkable identity with 32, I strongly suspect to be due to the same morbid process, and this notion gains weight from the history of the case.

History.

Column 4. *Personal.*

The personal history in such a heterogeneous mass of cases has little value. It is only of somewhat painful interest to note that in almost all instances of these invariable fatal cases, the patient was in perfect health before the commencement of the symptoms and nevertheless was condemned to an extremely painful and lingering death, although as a rule the mischief could have been readily removed by surgical interference.

Column 5. *Family.*

In the same way there are no facts of noteworthy value to be drawn from the records of the family history.

Column 6. *Total duration of Symptoms.*

Extradural growth—

Lipoma . .	Average about	1⅓ years.
Sarcoma . .	,,	9 months.
Echinococcus .	,,	6 months.
Tubercle . .	,,	1½ years.
Scirrhus . .	,,	1½ years.
		5 yrs. 7 mos.

General average about 1 year, 1 month.

Intradural growth—

Myxoma . . .	Average	4¼ years.
Fibroma . . .	„	3½ years.
Sarcoma . . .	„	2 years.
Psammoma . .	„	3⅓ years
Tubercle . . .	„	8 months
Parasitic cysts . .	„ (?)	9 months
		14 yrs. 6 mos.

General average about 2 years 5 months.

From these figures it is evident how much more chronic are the symptoms when the mischief is within the theca than when outside it. Doubtless this is simply owing to the prevalence of the simpler forms of neoplasm among those growing from the spinal membranes. To whatever cause it may be due the fact is important in assisting the probable diagnosis.

Column 7. *Course of Symptoms.*

Nothing obviously is of more importance than the special manner in which the symptoms are gradually developed. Unlike those occasional instances in which a cerebral tumour suddenly produces pressure symptoms, the spinal cord tumour seems practically never[1] to initiate such a condition. The only noteworthy exceptions being for the most part parasitic cysts which sometimes owing to the hydrostatic conditions under which they exist, suddenly enter the neural canal in some position of flexion of the spine. See Case 16.

Review of the whole number of cases, regarding them all as simple instances of mechanical pressure on the cord, is perfectly justifiable for the correct estimation of the relative sequence of a few symptoms, the remainder being considered in their development under their special headings in Columns 8 to 20.

[1] Sir B. Brodie in the 'Lancet,' pp. 378, 379, gives a case in which an intramedullary growth produced sudden paraplegia.

Column 8. I. *Extradural Growths.*

Of seventeen cases belonging to this class in which the course and development of the symptoms was fairly recorded, the first symptom was pain in seven cases, motor paralysis in six, the two combined in one case, motor and sensory paralysis combined in another, and finally muscular spasm in one case. Most frequently in the subsequent development of the chain of symptoms, sensory paralysis came later than motor, frequently the patient noticed the two to be developed simultaneously. Altogether twitchings of the muscles were recorded historically in but three cases see, however, Column 12.

The symptoms as a rule indicated diffuse pressure within the neural canal, for in only five[1] was there an approach to transfer of symptoms from one side to the other (right to left in three cases left to right in two). It is proper to add, however, that in four other cases the symptoms showed a tendency to be most marked on one side (the right in four cases the left in one).

Summing up we have thus ten cases in the seventeen in which there was an incomplete unilateral character in the symptoms.

However, the most important point in the development of the symptoms is of course the march, and in this extradural division of the cases it is clear that the commonest march would be **Pain, Motor paralysis, Sensory paralysis.** It being very distinctly understood that it is common in this condition to have the motor and sensory paralyses in close combination both in degree, relatively speaking, of course, and in time.

II. *Intradural Growths.*

In contrast to the comparatively frequent occurrence of ill-defined arrangement of symptoms in the extradural growth, we have in the intradural a most remarkably constant march. Thus from a total of thirty-three available cases twenty-one begin within pain as the first symptom, four pain combined with motor paralysis as a first symptom, and but six with motor paralysis alone. The subsequent march is just as striking, the loss of motor power preceding sensory paralysis in the very large majority of cases, indeed only in four instances out of the total of thirty-three did sensory paralysis precede motor. Therefore the march is easy to write in these intradural cases, being **Pain, Motor paralysis, Sensory paralysis.**

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[1] *i. e.* 29 per cent.

Of greater interest, and for diagnostic purposes of greater value, are the facts relating to the transference of the symptoms from one side of the body to the other, the possibility of localisation of the growth being thereby of course greatly increased.

Careful observation of such cases (as, for example, No. 50) indeed reveals, in some instances, pathological effects such as make the condition tantamount to hemisection of the cord, so that we have reproduced clinically the classical experiment of Brown-Séquard. But in the majority of cases we have to derive our information from the unskilled observation of the patient or the friends, so that at the most we learn that transference did occur. The transference in this division of the cases is very different to that in the extradural, inasmuch as in this variety the interval between the invasion of the limbs successively affected is usually weeks and occasionally months.

Of the thirty-three cases such marked transference was noted in sixteen cases, *i. e.* 48 per cent., which is a great advance upon the 29 per cent. of the extradural growths. Of these sixteen cases in nine instances the transfer was from the left to the right, in seven from right to left.

Grouping both divisions of the case together we find that as soon as the paralytic symptoms are well developed, the pain (for fuller details of which see the discussion of the next column) becomes horribly exaggerated, then decubitus occurs, and later the patient dies pyæmic or uræmic, by septic absorption from the bedsores or from the decomposition of the urine.

Column 9. *Pain.*

From the time of Cruveilhier the pain accompanying the development of intraspinal tumours has been reckoned with paralysis to be the most noteworthy symptom in the affection. Its course is almost always insidious, excessively rarely is it sudden in its onset, being then obviously owing to hæmorrhage or rupture of a cyst. At the first and indeed throughout the course of these cases they have almost invariably been diagnosed as rheumatism; consequently it behoves us to examine closely into its character to see whether there are not features peculiar to it which should prevent such a melancholy mistake in the future. We will therefore go through the records of the pain in the tabulated cases from this standpoint.

First we note the immensely important fact that however severe the pain may be it is never referred to any part above the seat of the lesion. To this there seems no exception. Besides Case 32 there are several which show this most strikingly. While thus the symptom is never placed above the lesion it is only localised below the lesion, a matter of extreme import to the operator in search of a tumour, &c.

If possible it would be most interesting to determine exactly the localisation of the pain as contrasted with the actual position of the tumour, because we should thus have, owing to the constancy of pain as a symptom, a powerful addition to the array of diagnostic guides. Although the records at our disposal are unfortunately greatly wanting in this respect, those cases which do point to some conclusion on this question had better now be referred to in a little detail.

Case 7. In this case the growth was situate from the sixth to the eighth dorsal vertebræ, *i. e.* bodies. The pain was referred to the distribution of the ninth dorsal nerve. Similarly in Case 32 the growth was opposite the third dorsal vertebra (body), the pain being distributed in the area supplied by the fifth nerve. In these two instances the difference between the position of the growth and the localisation of the pain was clearly due to the anatomical relations of the nerve-organs and roots to the vertebræ, and something more, viz. the as yet (in the human being) imperfectly known course of the fibres in the spinal cord. Thus in Case 32, as is stated in the history of the operation &c., the growth was diagnosed to be opposite the highest root of the fifth nerve, *i. e.* localising it by means of the pain and anesthesia, but as a matter of fact the tumour was situated four inches above the zone of anæsthesia. It is possible that the actual pressure of the growth upon the cord produces much less effect on the intramedullary fibres than one would expect, and this would seem to explain why the ascent of the distribution of anæsthesia to the level of the lesion is so very long in completely developing. Extreme cases are those in which, as in Cases 11 and 13, extradural pressure, the lowest point of which was the third dorsal vertebra in the one case and the fourth dorsal vertebra in the other, produces pain referred to the lower limbs. The other extreme, viz. perfect localisation by means of the nerve, is to be seen in Case 28, where invasion of the fifth dorsal root upon which the tumour was sessile caused severe pain in the corresponding intercostal space. Probably also Case 46 is of a like character, an example of intermediate cases for which no explanation appears forthcoming save such as I have suggested in No. 41, where we have the pain for a long while referred to the distribution of the ulnar nerve most particularly, although the growth did not descend lower than the fifth cervical vertebra, the ulnar nerve of course deriving most of its fibres from the eighth cervical and the first dorsal. In this last case there were certain vague pains felt in the neck and shoulder, which of course might certainly be taken as suggesting possible affection of the cervical nerves as high as the fifth, but these were evidently insignificant compared to the localisation of the pain to the distribution of the ulnar nerve. The only conclusions then that we can draw to guide us in this matter are, firstly, that if the pain be extremely well defined in the course of one nerve of one side then a lesion may be diagnosed to exist in the course of that nerve and so it may be localised with ease; secondly, that where there is no delimitation of the pain, but where the anæsthesia is apparently well marked and in accord with nerve-supply, it is necessary to be most cautious and to define if possible the upper border of the hyper- or paræsthetic zone which so usually surrounds the upper limit of the anæsthesia, but applying what has gone before, the proper course to follow will obviously be the exploration of the neural canal and its contents at the highest point that is suggested by any definite symptoms, and among such we should include even slight paræsthesia. Pain of a constant dull aching character seated in one fixed point in the spinal column is of course most valuable as indicating the focus of disease, but caution is requisite here again, and unless the limitation of the pain is very distinct it would be best to regard it as of slight value. If, though slight, it is accompanied by a symptom of which very little notice is taken, to judge by records, but one nevertheless of great value, namely, a sensation of weakness felt by the patient at that point in the spinal column, and if this sensation, which is of course subjective, be heightened by fatigue, then it assumes a leading position among the localising symptoms.

We may now proceed to consider[1] the character of the pain with regard to its diagnostic value. Noting usual forms first we must begin with the subjective sensation of burning, which occurred as frequently as in five out of the fifteen cases in which the pain was carefully described. In Case 32 this was extremely marked, the patient complaining that the whole of the left side and lower limb appeared to be red-hot and burning. In another patient the pain was described as roasting. This consequently would appear to be an important fact to remember in dealing with painful conditions of the spine. The most frequent form of pain is that common to many affections, namely, shooting. In two instances it is described as pricking, in one as gnawing, and in one as stabbing, but little value attaches to solitary statements of this kind, especially as a full description is so seldom given. The next point is the relative amount of pain excited by the presence of the tumour. This, of course, is only to be correctly estimated in the intradural division of cases. Careful examination of the cases in which the pain is noted shows that even after eliminating possible errors it is a more prominent feature in those cases where the pressure is directed postero-anteriorly, and antero-posteriorly, than in those in which it is directed laterally. This is easy to understand in view of the fact that in the first two directions the pressure will directly influence the extremely sensitive posterior columns. The exceptions to this generalisation may be very striking, as, for instance, in Case 32.

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[1] In the intradural division only.

It will not escape notice in the tables how almost invariably the pain in the lower limbs ascends from the soles of the feet in precisely the same manner as the anæsthesia is almost always subsequently developed.

Considering the extreme frequency of pain from tumours pressing on the spinal cord it is worth while glancing at those few instances in which pain is not recorded. In none of the cases of extradural lipoma is pain recorded. Probably this omission may be attributed in great part to the age of the patient, and has consequently been omitted from the records, but again it is not recorded in Cases 33, 35, 49, 57. Unfortunately these latter are just cases in which the notes are not so complete as could be wished, so that it would be hazardous to guess what the absence of record signifies. In view of the general obscurity of the subject, however, it is worth while to draw attention to the point.

Column 10. *a. Paralysis of Motion.*

Few things are more regrettable than the almost complete absence of record as to the mode in which the motor paralysis in these cases successively invades the various segments of the limb. So far as can be made out the advance of the paralysis is from above down. The patient in five cases of paralysis of the lower extremities was unable to stand before loss of the movements of the leg when lying down, and this form of early paresis was not necessarily accompanied by such sensory paralysis as produced ataxia. In one case of paralysis of the upper limb the result was different, the fingers being stated to be paralysed while the shoulder was only weakened. It is most desirable that this subject should be elucidated as soon as possible for the sake of prognosis as well as diagnosis, and all observations should be complete for each segment from the hip to the great toe, the representation of the latter being specially interesting.

b. Paralysis of Sensation.

The gradual abolition of sensibility appears in all cases to advance up the limbs from the soles of the feet. Here again the difference between the appreciation of various forms of sensory stimulation needs much careful examination in the future, and notably the contrast between pain, touch, and temperature (see Case 28).

Column 11. *Reflexes.*

In every case, without exception, if the cord were pressed upon, the reflexes both superficial and deep became greatly exaggerated. As the cord became completely destroyed and descending degeneration and wasting marked, so the reflexes were gradually lost, the abolition beginning almost invariably with the plantar and passing upwards.

Column 12. *Spasms with Clonus.*

According to well-known facts, spasms and clonus (ankle and knee ?) were noted in the large majority (61 per cent.) of the intradural cases and in 35 per cent. of the extradural. It is noteworthy that among the latter they were only recorded as accompanying the development of lipoma and echinococcus cysts. The reason of this is not apparent.

The genesis of such spasms is slightly illustrated in the Table by but one case, No. 28, in which the spasms are noted as occurring on the same side as the tumour. Hence we may obtain, on further examination of future cases, evidence as to the direct effect of pressure in this connection.

It is worth mentioning that in one case in which the spasms were originally most severe they disappeared one month before death, *i. e.* when the cord became so disintegrated as no longer to react to the irritation.

Column 13. *Rigidity.*

Closely connected with the foregoing column is that of rigidity. Like spasm and clonus this is very much more frequent with intradural than extradural growths, the percentages of recorded occurrence being respectively 50 per cent. and 15 per cent. Consequently, there is good reason for supposing that the existence of marked rigidity is evidence of intradural mischief.

A point of interest now arises. In fourteen cases of intradural growth in which it was recorded, in eleven the attitude assumed by the contractured limb was that of flexion, in three that of extension. One case suggests a cause of this difference. In one instance in which the tumour was found on the right side of the spinal cord the right lower limbs were the seat of spasm in flexion, whereas the left lower limb was in extension. It would seem as if the growth specially induced irritation effects according to the intensity of the pressure employed. Thus, in the initial stages of the "pressure myelitis" the spasms may be those of extension, while in the final condition flexion predominates. The same thing may be noticed in the pressure myelitis resulting from fracture, dislocation of the spine, &c.

Column 14. *Decubitus.*

The formation of bedsores is of course the rule, and these are noted almost invariably in the cases of intradural growths as being terribly extensive. In many instances the buttocks are deeply excavated as far as the trochanters. In two cases (Nos. 47 and 32) the bedsore was situated on the same side of the body as the tumour, just as cerebral decubitus is seen on the opposite side to the nerve lesion.

For the effects of the decubitus see p. 53.

Column 15. *Nutrition.*

The nutrition of the paralysed parts is variously described as affected. Thus, in a few instances the change is mentioned as local, twice in the extradural and five times in the intradural growths. There is of course wasting when the growth penetrates an intervertebral foramen and destroys a nerve-root, but the instances in which local wasting occurs, *e. g.* of one lower limb as in Cases Nos. 24, 41, when the pressure is general are very rare. In eleven cases of both kinds of growth the wasting is described as general, and it may be that this general emaciation has led to supposed observation of local atrophy.

As a rule the nutrition is not impaired unless the paralysis be complicated with pyæmia, &c.

Column 16. *The Spine and its Physical Examination.*

This is a very interesting point, but not one from which much can be learnt, for out of the thirty-one cases (in both groups) in which the examination was made, it is distinctly stated in thirteen that nothing could be discovered.

Putting aside the six cases (five extra- and one intradural) in which the problem of diagnosis was obviously solved by the presence of an external tumour solid or containing fluid, we may proceed to note one or two important facts, although the number of cases remaining at our disposal is only twelve.

A review of these shows that the alterations in the spine produced by an *intradural* growth are as follows :

1. Tenderness on percussion.
2. Stiffness and weakness.
3. Curvature usually lateral.

The relation of each of these to the seat of the tumour is the most valuable evidence they offer, and that is as follows.

Perhaps the correspondence or want of the same will best be shown in parallel columns. Thus :

Tenderness on pressure was felt at the	The tumour was situated at
Mid-dorsal region.	5th D. nerve.
10 D. V. and downward.	7 to 10 D. V.
1 to 4 C. V.	4 to 5 C. V.
5 to 7 C. V.	4 to 5 C. V.
1, 2, 3, 10 D. V.	2 to 3 D. Nerve.
7 C. V.	1 ? and 5 D. ?
6 D. V. (spinous process).	3 to 4 D. Nerve.

From this Table it appears that practically without exception a tumour occurring in the dorsal region is higher than the spot described as tender on pressure. In the cervical region this generalisation does not seem to hold so closely. It need hardly be pointed out that the inclination of the nerve-roots goes far to explain this, but the cases are too few and unfortunately but too rarely recorded in precise detail to admit of laying more weight on this point.

If "stiffness" be present it will be found to closely correspond with the portion of the tumour.

Similarly, if "curvature of the spine" is observed it will be found to be a secondary result of the tonic spasm of the spinous muscles, and therefore the concavity of the bend is on the same side as the growth. Removal of the source of the spasm, as in Case 32, restores the line of the spine.

Column 17. *The Pupils.*

As a symptom of this class of cases, change in the size and activity of the pupils only occurs when the cord is pressed upon above the level of the second dorsal nerve. When this happens, as in Case 4, the dilator fibres are of course paralysed, and the pupil becomes smaller than that of the opposite side, and almost immobile.

Column 18. *The Urine.*

As a rule the urine becomes retained in the bladder as the paraplegia is gradually developed, and following such retention comes decomposition and then cystitis. The organism (*Streptococcus pyogenes* ?) which sets up the cystitis gains access by the ureters to the kidneys, and there develops, causing interstitial nephritis, the usual direct cause of death in these cases. In but four cases is the urine recorded as normal, viz. extradural scirrhus, extradural tubercle, intradural fibroma *not causing paralysis of any kind,* intradural sarcoma in which rapid generalisation occurred.

It is curious to note that in the first two instances the lower limbs were œdematous. No change would be expected in the third case.

This is not the place to enter into any discussion as to the cause of the alkalinity of the retained urine and its subsequent decomposition. Suffice it to say that, as proved on p. 27, the reaction does not depend on the introduction of the *Micrococcus uræae* from without.

In the scirrhus case polyuria occurred.

Column 19. *Vaso-motor changes.*

The changes which may be attributed to perverted vaso-motor action are of course summed up in the word swelling. This was noted but six times in the whole fifty-eight, consequently it cannot be looked upon as an important symptom. Neither, unfortunately, can one learn from the accounts of the case why it should have occurred even thus rarely.

Column 20. *Vomiting*

Was never present as a direct result of the cord mischief.

The circumstances which relate to the tumour must now be grouped together for consideration.

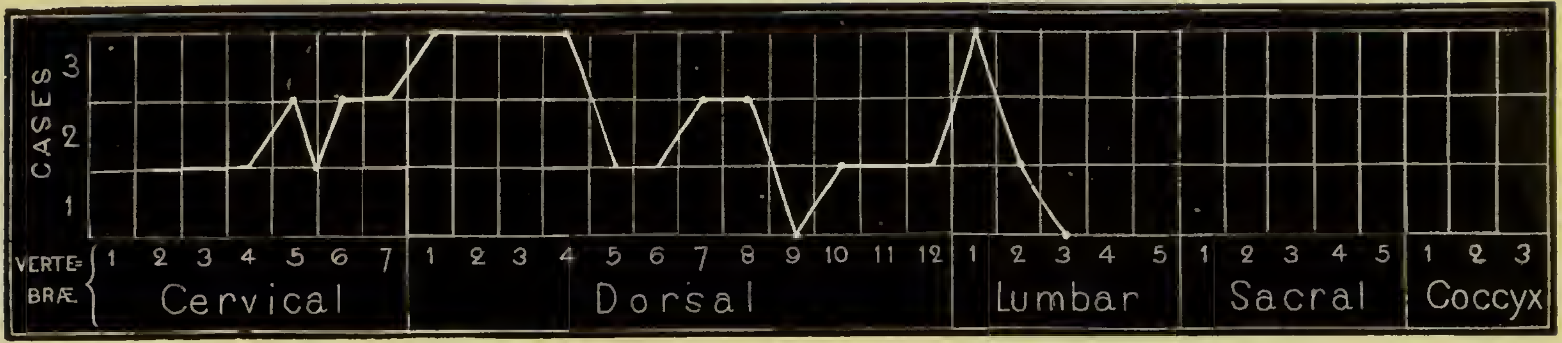
Column 21. *Relation to the Dura Mater.*

For every reason the relation of the growth to the dura is of the first importance. It has already been shown that we may thus separate tumours of different nature as being of practical certainty situated either inside or outside the theca. For the further bearings of this point on these cases reference must be made to the foregoing pages.

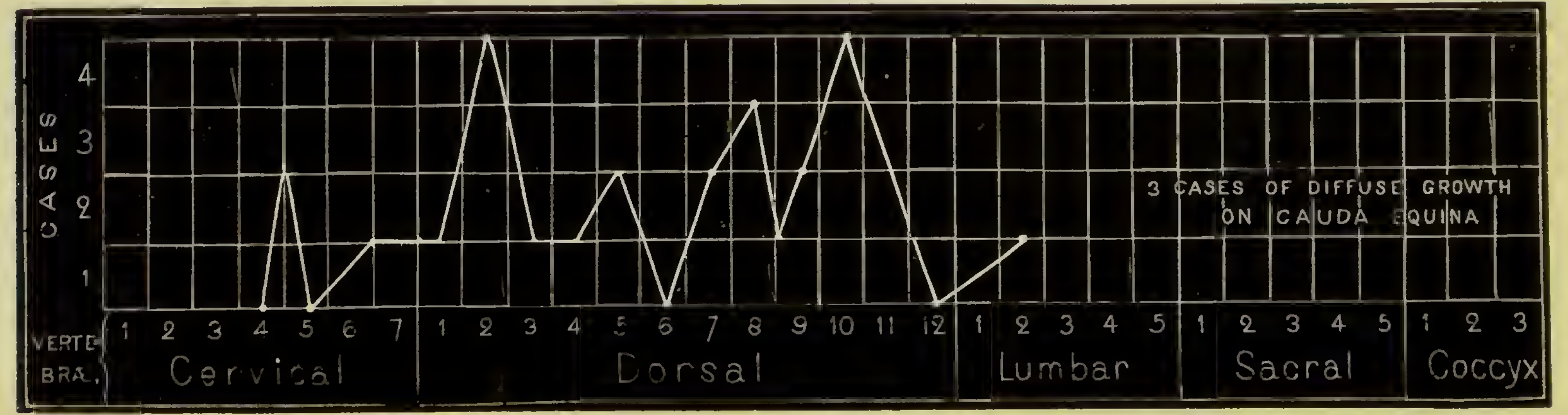
Column 22. *Size.*

The size of the growth in any particular case is limited by the size of the theca, the amount of its lumen taken up by the cord, &c. As a rule the mass is oval or ellipsoidal, *Curves showing the Prevalence of Growths at different Points in the Spine.*

I.—*Extradural.*



II.—*Intradural*



Note.—The curve in the extradural group is necessarily of much less value than No. II in that in individual cases in the upper dorsal region affected so many vertebræ as to prevent localisation.

the long axis being parallel to the middle line of the cord. A necessary result of the variable position of the growth is that tumours of the same size produce widely different effects, consequently the size *per se* has little bearing on the symptoms.

Column 23. *Position.*

There are several ways in which the position of the growth assumes importance, viz.:

1. In relation to the causation of the growth.
2. The relative effects of the growth. (*a*) According to its vertical position on the cord. (*b*) According to its horizontal position on the cord.

(*a*) On grouping all the cases in the Table together, it is at once obvious that most of the cases occur about the following points in the spine:

1. Just below the centre of the cervical region.
2. The upper end of the dorsal region.
3. The lower end of the dorsal region.

These regions are those in which there is least intrathecal spare space. Moreover, just as the cases increase in number from the cervical region downwards so the cord becomes less and less firmly fixed in the theca. Whether it is injudicious to regard all these facts as pointing to a traumatic[1] origin of the majority of the growths time alone will show. The cases in which there was good reason to suppose that direct injury was the exciting cause of the growth are not specially grouped around one of the above-mentioned regions, so that until we have before us the fuller and more accurate accounts of future cases we must leave undecided the bearings of the position of the growth.

It must be observed in passing that no one kind of growth is peculiar to any one region of the spinal column.

(*b*) The position of the growth in causing the production of definite symptoms, according as to whether it is on the anterior, posterior, or lateral columns, has already been in great part described. But it remains to be mentioned that the *relative* rapidity of development of the pressure in these tumour cases seems to have prevented such minute analysis as is possible in pressure of the cord from caries of the spine producing curvature. Moreover, the diagnosis having usually been wrong, and attention having been concentrated on the pain, the initial stages have been so badly described as to make it impossible to place much trust on the accounts, as explanatory of the influence of position.

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[1] *E.g.* including direct injury, changes of temperature, &c.

Column 24. *Nature of the Growth.*

The nature of the growths is set forth in the headings of each division of the table, and as far as possible the details of the structure of the tumour are supplied in each case. Leaving out the parasitic cysts, &c., the conclusion from the list of names is obvious, namely, that almost all these tumours are those of the simple connective-tissue type, and that they spring from the arachnoid, or more rarely, from the pia mater. With the debated origin of psammoma we have nothing to do here, but the epitheloid covering of the arachnoid sufficiently indicates its possible source. Although too, as before stated, some of the diagnoses of the real nature of the growths are uncertain, still, whatever the kind asserted, there is one characteristic common to all the localised intradural kind which is of the highest importance. This is the fact that they are almost invariably covered with a thin capsule (derived from the arachnoid ?) and that their connection with the spinal cord is of the slightest. Consequently, they can be dissected from it without causing the slightest injury to a single nerve-fibre. In this connection reference may properly be made to the fact that since the tumours are as a rule of the simple connective-tissue type, extremely localised and slow growing (average duration of symptoms in intradural growths being about two and a half years, with the resultant production of a small mass of tissue weighing a few drachms), recurrence after removal is not to be expected. In Case 32, the only one at our disposal for illustration of this point, there is not the slightest sign of recurrence one year after, nor is such probable.

Column 25. *Effect on the Cord.*

The effect on the cord varies widely, even among growths of the same nature, of much the same size, and apparently producing much the same effects, as far as general symptoms are concerned, and in cases where much the same kind of secondary changes appear to have occurred (see, for instance, Cases 47 and 48).

The cord was softened (*vide infra*) more frequently with intradural than extradural growths, the percentage for the former being 55, and for the latter 46, of the cases in which changes in the cord were noted as present or not. When softening occurs it appears always to pass through the stages of congestion (this being almost always noted as occurring in the neighbourhood of the tumour), red softening, yellow softening, and grey degeneration. All these require no detailed account. So too when the softening has interrupted any of the great tracts of fibres in the cord there ensues ascending and descending degeneration of the ordinary kind and extent.

One further point with regard to the softening requires notice, and that is its distribution. Of course naturally it is most marked opposite the centre of the growth, but its farther extension is of course a matter of much importance and interest. Of six cases in which it is recorded to have occurred, in four it spread downwards and in two upwards, one very slightly. Doubtless this distribution is due to thrombosis of the great median medullary vessels.

Column 26. *Treatment.*

For all the horrible sufferings of the fifty-eight cases in the Table, in only two was any treatment of avail, viz. Nos. 4 and 32. In the former case excision of a part of the growth relieved the pressure, and so the symptoms for a time. In the second the complete removal of the growth has, it may be hoped, obtained permanent relief. Unfortunately the condition of the patient, owing to the errors of diagnosis, has usually been made more hopelessly miserable by free use of the actual cautery, moxas and blisters, while in other instances the additional employment of mercury, iodide of potassium, &c., has been resorted to.

Column 27. *Records of the Autopsy, especially with respect to the Presence or Absence of any other Lesion which, independently of the Tumour, would have caused Death.*

The melancholy inspired by consideration of Column 26 is intensified by the facts of Column 27, for in no less than 74 per cent. of the extradural growths, and 83 per cent. of the intradural, the patient died simply from the direct effects of the tumour, *i. e.* from exhaustion (in a very large number of cases), owing to pain, &c., or from pyæmia owing to absorption from the bedsores, or from septic pneumonia, or from acute septic interstitial nephritis.

Roughly speaking, therefore, about 80 per cent. of these miserable cases could have been relieved entirely by operation, and those which were hopeless might by relief of pressure have been granted a euthanasia.

The simple effects of confinement and nerve exhaustion are seen in the four instances in which fatty degeneration is noted among the effects of the intradural growths.

Conclusions.

The lessons of the facts detailed in the foregoing pages are so extremely obvious that very few words are required to set them forth. They amount to this, that, granted the diagnosis is correctly made, there is but one treatment, viz. removal of the source of pressure by operation. It may at once be said, and rightly, that the question of diagnosis in the large majority of cases arises when only as yet one cardinal symptom is before us, most commonly pain, and that therefore a diagnosis of such certainty as to warrant exploration is not possible. To this nothing can be objected in view of the responsibility the surgeon takes upon himself, but at least absolution from the major part of such responsibility is obtained with the discovery of the first localising symptom independent of the constancy, the position, and the character of the pain. The differential diagnosis of the cause of painful paraplegias, material for which is given in the table, considered fully, would be quite beyond the object of the present paper, and must be reserved for another occasion. A close survey of the conditions under which tumours have been found will meanwhile afford the best aid to the recognition of the real nature of doubtful cases.

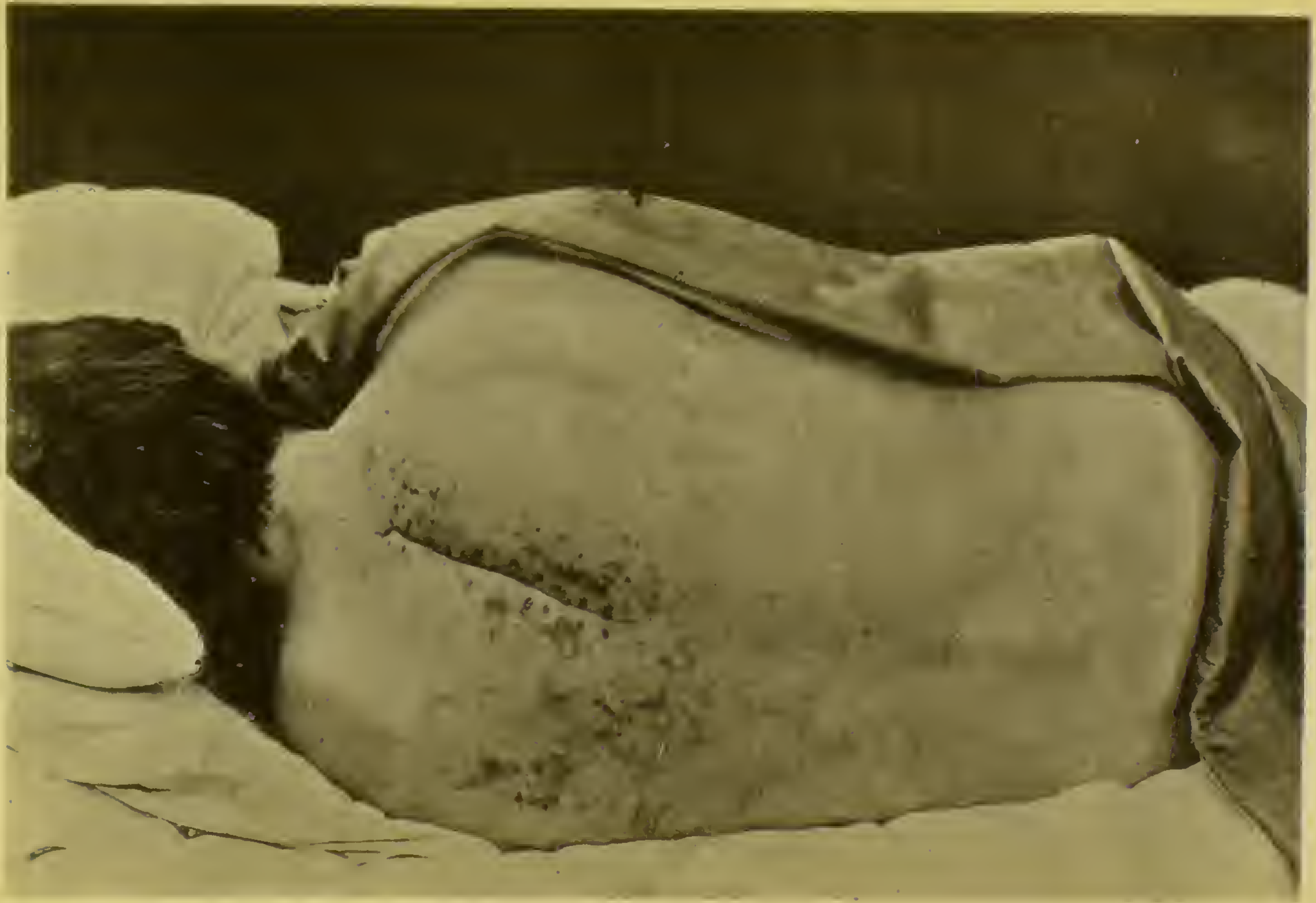
(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 407.)

DESCRIPTION OF PLATE III.

A Case of Tumour of the Spinal Cord (W. R. Gowers, M.D., F.R.S., and Victor Horsley, B.S., F.R.S.).

A photograph was taken about July 31st which gives a view of the back of the patient, showing the scar of the operation. The spots around the scar are traces of small pustules, which, however, gave the patient practically no trouble, and which were caused no doubt by the irritation of the large quantity of cerebro-spinal fluid soaking the dressings and dissolving the perchloride of mercury, &c., contained therein.

PLATE III.



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EXTRADURAL GROWTHS.

No. of case.	Sex, age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
					Illness.																							
			Personal.	Family.	*a.* Total duration	*b.* Duration under observation.	*c.* Course of symptoms.	Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Lipoma :																										
1	M.	—	—	—	1 year	—	Illness began with weakness in lower limbs; patient could not stand, but could extend legs in bed	—	*Motor paralysis:* almost complete. *Sensory paralysis:* incomplete tactile anæsthesia; algesia	—	—	—	—	—	—	—	—	—	—	Outside dura	Largest was 2 inches long (in fig.)	Multiple lipomata; only one of size to produce changes in cord (6 figured)	—	Cord softened beneath largest tumour	—	Death	Pneumonia	Albers, Atlas, Plate xxix, fig. 1; text, p. 28 of description of plates, 1832—1847.
2	F. 4 yrs.	—	—	—	—	Several days	Gradual weakness in lower limbs for few days before seen; 1½ months before admission patient felt her legs suddenly bend under her	—	Incomplete motor paralysis of the lower limbs, especially in the left side; sensibility diminished more on the left than on the right	—	Noted in history	—	Child caught scarlatina and died with gangrenous vulvitis	—	Nil discoverable	—	—	—	—	Outside the dura mater	Filled the whole breadth of the spinal canal	The growth extended over the whole dorsal and lumbar portion of the theca, "undeniably compressing the spinal cord"	Lipoma	Not noted	Actual cautery applied 4 times in the lumbar region, produced a "little improvement"	Death	—	Chapelle, Bulletin de la Soc. Anatomique, 1846—1847, xxii, year, 3rd decennial series, vol. ii, p. 6.
3	3 yrs.	—	—	—	2 years (?)	3 years (?)	Gradual onset of slight hemiplegia after severe convulsions, *vide* "Spasms"	—	Incomplete right hemiplegia	—	"Spasmodic action of the right half of the body;" "severe convulsions," with "partial insensibility," when one year old; these "returned," and caused death when 3 years old in 3 hours	—	—	—	—	—	—	Congestion of brain and spinal cord above the seat of the tumour	—	External to dura	2½ inches long, "the breadth of the canal;" ½ inch thick	The tumour lay opposite 7th cervical and 1st dorsal vertebræ	Lipoma	Unfortunately not examined	—	Death	None whatever could be found; vessels of central nervous system congested	Obré, Trans. of Pathological Society, 1850—1852, vol. iii, p. 248.
4	M. 10 mos.	Congenital	—	—	11 months (?)	2 months	Gradual appearance of the sacral tumour, accompanied by twitchings in right leg	—	—	—	Frequent spasms or twitchings of right leg	—	—	—	Tumour (1) visible projecting from the lower posterior surface of the sacrum	—	—	—	—	(1) Outside the dura mater (removed successfully by operation). (2) Conical mass within the theca springing from the seat of original growth, and pushing the cord aside	(2) Resembled the end of the finger	(1) Commenced probably opposite last sacral vertebra, and pushed its way into the canal; found at operation to reach to level of lowest point of sacro-iliac synchondrosis. (2) ? Opposite lower border of 1st sacral vertebra, projecting up along the right side and posterior surface of the cord, so as to include the lowest nerves in the mass	Lipoma	The cord was pushed forward and to the left	Excision of (1) with great relief of symptoms	Death	Acute peritonitis (causing death 8 weeks after wound healed and symptoms disappeared)	Athol Johnson, Trans. Path. Soc., 1858—1857, vol. viii, pp. 16—28.
		Sarcoma :																										
5	F. 27	Secondary to uterine disease	—	—	—	—	The nerve symptoms began with numbness and paresis of the right arm and leg; this became complete in the arm, and then the left limbs were similarly affected	Pain in neck	Paralysis of right arm; incomplete paraplegia; paralysis of bladder, &c.	—	—	—	Repeated recurrence after removal of sarcomatous growth in the uterus	—	Swelling at the right side of neck and spine	—	—	—	—	Outside the dura	—	The tumour compressed the cord opposite the 6th cervical vertebra	Sarcoma of neck involving the right side of the 6th cervical vertebra, and invading the neural canal. *Micro. exam.*—Spindle-celled sarcoma	Cord unchanged (?)	—	—	Sarcoma of uterus, lumbar glands, lungs, &c.	Callender, Trans. Path. Soc. of London, vol. ix, p. 229, 1858.
6	—	—	—	—	—	—	—	—	Complete paraplegia	—	—	—	—	—	—	—	—	—	—	Outside the dura	"Small" mass	Over the posterior columns of the cord	(?) Sarcoma infiltrating the muscles of the back, and penetrating the intra-vertebral foramen into the neural canal	Cord compressed	—	Death	—	Simon, Trans. Path. Soc. of London, vol. i, p. 155.
7	M. 18	Exposure to cold	9 years before was kicked in side, causing much pain, for which was in hospital	Rheumatism on mother's side	6 months	½ month	Course of symptoms began with pain in the left side and constipation. A few weeks after admission felt weak and numb in his legs, and over his abdomen next day. Complete motor and sensory paraplegia of lower extremities	Severe (but "not excessive"), extending round the left side at first at level of 9th intercostal space; later became strong "girdle pain"	Did not alter (prev. state, see history), save that the anæsthesia gradually mounted from the 9th dorsal spine to the 6th ditto. Bladder and rectum became paralysed rapidly after the motor paralysis set in	At first all exaggerated, even in upper limbs; later completely lost	Ankle-clonus	—	Sacral and extensive	Muscles of lower limbs rapidly wasted	The pain in the back and side was increased by movement. Percussion around the 9th dorsal spine elicited much tenderness, and caused pain to pass down the right thigh	Normal	For a long time acid, then neutral, and finally alkaline	Erection of penis	Frequent and severe (suffered much from bronchitis)	Outside the dura	Elongated and fusiform (see next column);	Growing from the periosteum of the laminæ of the 6th, 7th, 8th dorsal vertebræ, penetrating posteriorly among the back muscles, and anteriorly so as to compress cord	Round-celled sarcoma	The cord was much attenuated, pushed aside by and completely softened by the growth. Below this point (*i. e.* 8—9 dorsal vertebræ) the cord was softened. Ascending degeneration noted in the posterior median column, the direct cerebellar tract, and in the antero-lateral	Palliative	Death	Hypertrophy of heart, with extensive valvular incompetency and disease. Bronchitis and some small secondary nodules of sarcoma scattered through both lungs. Urinary tract showed septic inflammation	Vincent Harris, Brit. Med. Journ., 24th Dec., 1887, p. 1380.
8	F. Young adult	—	—	—	Many months	—	—	—	Incomplete motor paresis, and anæsthesia in all the limbs, especially on the left side	—	—	—	Marked decubitus	—	—	—	—	—	—	Outside the dura	Bantam's egg	The tumour was situated upon the 6th cervical spine and neural arch, most of which latter had been destroyed	The growth was encapsuled, of light yellow colour and friable. *Micro. exam.*—It consisted of round and oval capsules in a connective-tissue stroma	Cord "atrophied" at seat of pressure, and twisted so that the right lateral column looked backwards	Mercury, iodide of potassium, and cantharides	Death	Nil. The growth absorbed most of the laminæ and transverse processes of the vertebra	Ogle, Trans. Path. Soc. of London, vol. vii, p. 40.

No. of case.	Sex, age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
			Personal.	Family.	Illness.			Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.				
					a. Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	26	29
Sarcoma (continued):																												
9	M. 10	A fall on the back	—	—	—	—	Some time after a fall patient felt pains, which began immediately he walked; gradual motor paralysis of lower limbs	Varied pains	Complete paraplegia of lower limbs	—	—	—	—	—	2 tumours, one in dorsal, the other in dorso-lumbar region; compression of the former (?) caused vertigo and uncomfortable sensation in forehead	—	—	—	—	Outside dura	Extent, see next column	(1) 2nd to 8th dorsal vertebræ inclusive. (2) In lumbar region	Round-celled sarcoma (?) in two masses, (1) and (2), growing from laminæ of vertebra, destroying these, and compressing cord and theca	Slightly softened where compressed	Antiphlogistic	Death	—	Obs. by L. Wolf, jun. Quoted by Ollivier, Maladies de la Moelle Épinière, tome 2, p. 473.
Tubercle:																												
10	M. 36	—	—	—	—	—	Illness began with pain in back, and, later, gradual loss of power and sensibility in the lower extremities; a constant pain in the back was present	Excessive pain in the back, especially on movement	Complete motor and sensory paralysis below pelvis	—	—	—	—	—	—	—	—	—	—	Outside dura	Length 3 inches	Opposite 3rd, 4th, and 5th dorsal vertebræ	"Tuberculous;" long, yellowish mass	Cord was compressed and atrophied for 3 inches	—	Death	Nil recorded	Brown-Séquard, Physiology of the Nervous System, 1860, p. 85.
11	F. 60	None known	—	—	3½ years	3 years	The trouble began with weakness of the lower limbs. Death resulted in a few days after admission from syncope	Pain in lower limbs	Paresis of movement in both lower limbs; "considerable insensibility" of surface of legs and lower part of body. Paralysis of bladder and rectum	—	—	—	—	—	Nil discoverable by surgeon	—	Normal	Legs were œdematous	—	Outside the dura	—	The diseased intervertebral disc was that between the 3rd and 4th dorsal vertebræ	The intervertebral disc appeared to be destroyed by tubercular disease	Cord compressed	—	Death	Nil	Ogle, Trans. Path Soc. of London, vol. xix, p. 16, 1868.
12	M. Middle aged	—	—	—	9 months	5 months	First pain in right anterior crural nerve; for this he rested, but soon it invaded right great sciatic; only relief by morphia. Paresis of lower limbs then began, and became complete paralysis 3 months before death. Sensation unimpaired	Severe pain, referred to the right sciatic and anterior crural nerves	Complete motor paralysis; sensation normal; hyperalgesia	—	—	—	—	General atrophy of body	Nil on examination	—	—	—	—	Outside the dura	1 inch in length	2nd lumbar vertebra	Yellow tubercle originating from caries of the 1st and 2nd lumbar vertebræ; also the other lumbar vertebræ to a less extent	The spinal cord in the lumbar region was somewhat diminished in consistency	Morphia	Death	Not examined	Ogle, Trans. Path. Soc. of London, vol. xvi, 1865, p. 24.
13	M. 24	—	Delicate	—	11½ months	11 months	Illness began with slight pain in the epigastric region and palpitation of the heart	Severe pain on touching the paralysed limb	Complete motor paralysis of both lower limbs; retention of tactile sensation; later great hyperæsthesia	No doubt exaggerated	—	Severe	Large and deep-seated decubitus	—	—	—	—	—	—	Yellow tubercle infiltrating dura	See next column	Affecting whole of anterior surface of dura from 6th cervical to the 3rd dorsal vertebra	Yellow tubercle	The cord was softened, especially from the 7th cervical to the 3rd dorsal vertebra. The softening affected specially the anterior columns, which were greyish white. The posterior columns were only slightly softened opposite the first three dorsal vertebræ	—	Death	Yellow tubercle in right occipital cerebral lobe, size of haricot bean; right lung, small soft tubercle towards apex; peritonitis tubercular	Serres, quoted by Ollivier, Maladies de la Moelle Épinière, tome 2, p. 483.
Echinococcus Cysts:																												
14	F. 22	—	Good; pregnant at 8 mos. when first seen	—	9 months	1 month	Gradual onset of anæsthesia, and motor paralysis of the lower extremities; no œdema nor emaciation; contemporaneous development of constant pain in the back increased on movement; occasional tremors and engorgement of right upper limb; the neck was inclined backwards and to the right, with fixation. At the 6th month the right eye was subject to tremors, flashes of light, and ptosis; these eye symptoms disappeared later. At the 7th month, after bleeding from the right arm, there followed complete motor and sensory paralysis in the right thigh, and later in the left. Commencing paralysis of bladder and rectum. Painless parturition. Puerperal fever. Death	Excessive local shooting pains in the right side—lower limbs	Complete paralysis, motor and sensory, of both lower limbs	—	Severe twitchings in both lower limbs, especially the right	—	Severe on sacrum and both buttocks	—	—	—	—	Swelling of right arm; (?) due to venous pressure	—	Outside dura, which was congested	—	Right 4th dorsal intervertebral foramen penetrated by a cyst; cysts extend up the canal to 1st dorsal vertebra, forming a collar round the theca	Cyst of thoracic wall and neural canal	The cord and nerves compressed were slightly atrophied	—	Death	Nil, save echinococcus cyst of right thoracic wall, reaching from the 2nd to the 4th rib	Chaussier, quoted by Ollivier, Maladies de la Moelle Epinière, tome 2, p. 527, 1837.
15	M. 42	—	Perfect health	—	6 months	Practically whole period	Sudden and complete motor paralysis of lower limbs, together with spasmodic flexion of the same, noted first on waking. (No symptoms whatever the previous evening.) At the same time paræsthesia, especially of cold in the paralysed limbs	Very severe, referred all along to feet; towards death, for 3 days, referred to lumbar region	Absolute motor paralysis of lower limbs; tactile and thermal sensibility much dulled, and transmission retarded; localisation of prick abnormal, *e. g.* foot referred to groin, &c.; later, complete paralysis of bladder and rectum	Highly exaggerated	Severe and frequent	Very severe; legs flexed and adducted	Enormous sacral decubitus	Very marked atrophy of contractured muscles	—	—	Ultimately ammoniacal and severe cystitis	—	—	Outside dura	Nut (compressing process of cyst)	Compressing dura at level of 11th, 9th, and 7th dorsal vertebræ, especially the last	Echinococcus cyst. (1) Growing beneath dorsal muscles, penetrating the thorax between the 9th and 10th ribs. (2) Small cyst, similarly beneath the dorsal muscles, penetrating between the spines, especially below the 7th dorsal, where it flattened the cord and theca against the body of the vertebra, which was reddened and carious.	Sclerosis of antero-lateral columns extending from the point compressed to the end of the cord; also ascending degeneration of posterior columns above the point of pressure	Rubbing, blisters, constant current, iodide of potassium, actual cautery	Death	The left lung was adherent to the thoracic cyst. No fatal lesion, save secondary cystitis and pyelonephrosis	Behier, Archives Générales de Médecine, vi series, tome 25, 1875, p. 340.

			History.					Symptoms.												Tumour.								
					Illness.																							
No. of case.	Sex, age.	Alleged cause.	Personal.	Family.	*a.* Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.	Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.	Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Echinococcus Cysts (continued):																												
16	F. 38	—	Doubtful syphilis	—	3 years	40 days	3 years before admission she had dull pains in the lumbar region and weakness in the lower limbs. 1 year before admission, in lifting a heavy weight, she felt something crack in her back, causing a cry of pain. The lumbar pains at once began severely, and never ceased. Walking became more difficult, and the pains spread down the thighs. When she tried to walk the ground felt elastic, and severe spasms occurred. The same painful spasms occurred in bed, but disappeared about 1 month before death, when there supervened paralysis of the bladder and rectum	Most excessive. Continually in the feet, the legs, thighs, and kidneys. Described as if constantly being roasted in a fire. The least movement caused great pain	Complete motor and sensory (*i. e.* localisation and normal appreciation of sensations), paralysis in lower limbs; extreme pain even when lightly touched; bladder and rectum paralysis	Plantar absent	Very marked, disappeared about 1 month before death	—	Very extensive and horribly painful	—	Soft point discovered between the spines of the 12th dorsal and 1st lumbar vertebræ (this condition was stated by the patient to have existed since childhood). Doubtful impulse at this point on coughing. Soft point was surrounded by bone (supposed to be an imperfect spina bifida)	—	—	—	—	External to dura, which was intact	The compression was exerted for 4 cm. of the cord, and, according to the figure, exactly along the origin of the 1st lumbar nerve	The centre of the compression was opposite the disc, between the 12th dorsal and 1st lumbar vertebræ	Echinococcus cysts, which commenced in the vertebræ, enveloped the spine, and entered the spinal canal, and so compressed the cord from behind	The cord was severely compressed, and was of a brown-red colour	Moxas applied to spine, &c.	Death	None whatever recorded	Cruveilhier, Anatomie Pathologique du corps humain, Livraison xxxv, pl. vi, figs. 1, 2, 3, 4.
Myxoma:																												
17	M. 63	—	—	—	—	—	—	Intolerable; girdle sensation in lumbar region; tearing pains in the hips. Later extreme pain in the left upper limb	Paralysis of lower limbs, bladder, and rectum	—	—	—	Decubitus of sacrum	General marked wasting of body	Rheumatic pains, rapid onset	—	Ammoniacal cystitis	—	—	(1) Between dura and bones. (2) Ditto	(1) 3 cm. by 1·5 cm. (2) (?)	(1) Growing around 1st lumbar vertebra and penetrating spinal canal at this point and compressing the dura mater (2) Between the 8th and 7th cervical vertebræ, slightly compressing the dura	(1) Myxoma and fatty tissue. (2) Red pulpy mass	—	—	Death	Myxoma in right obturator region of thigh, apparently growing from obturator and saphenous nerves. Small (2 by ·8 cm.) lipomatous tumour growing in arachnoid, opposite left anterior cranial fossa. Broncho-pneumonia; liver cystic; lumbar lymph-glands infected	Virchow, Virch. Archiv, Band xi, p. 281.
Mixed Fibro-chondro Lipoma:																												
18	M. —	Sleeping on damp ground	—	—	—	—	Gradual onset, with intermittent exacerbations, ascribed to exposure to cold	—	Paralysis of lower extremities	—	—	—	—	—	—	—	—	—	—	Outside the dura mater	Hazel nut	The growth was situated between the laminæ and the posterior surface of the theca	Fibro-fatty enchondroma	Not noted	—	—	None	Virchow, Die Krankhaften Geschwülste, Berlin, 1863, Band i, p. 514
Fibro-Sarcoma:																												
19	F.	—	—	—	—	—	—	Severe in right upper limb	The left upper limb was the seat of complete motor paralysis, but sensation in it was normal The right upper limb was frequently the seat of severe paroxysmal pain. Each paroxysm was immediately followed by numbness, which spread to the fingers, and was accompanied by complete motor paralysis	—	—	—	Nil	—	There was an ulcerated new growth infiltrating the left side of the neck, and spreading through an intervertebral foramen, so as to spread over the theca	—	—	—	—	Outside the dura	See next column	The mass extended from the 2nd cervical to the 4th dorsal vertebra	"Encephaloid," probably fibro-sarcoma	Not noted. The roots of the cervical nerves entering the brachial plexus were described as being compressed by the growth so as to produce paralysis	—	Death	—	Ollivier, Maladies de la Moelle Épinière, tome 2, p. 487.
Scirrhus:																												
20	F. 48	Secondary to cancer of breast	Delicate; gastric ulcer 18 years old	—	1½ years	1 year	Cancer of breast appeared first, and a few months (6?) later a powerful pain in left side, in the hypochondria, midway between the margin of the ribs and navel. Pains extended to vertebræ. Later similar pains attacked right side	Excessive, worse on movement. Later, seated sometimes in sacrum and axillæ and between iliac crest and ribs; frightful pain before death; dementia	On admission free power of lower limbs in bed, but diminished sensation. Later, pains decreased; it was found that there was marked motor paresis of both lower limbs; incoordination with eyes shut; complete anæsthesia of both lower limbs as high as margins of ribs; doubtful changes on thorax. 3 months before death paralysis of bladder (constipation originally), later of rectum. Upper limbs later felt stiff	—	Began first in left lower limb, then in right; severe flexion and extension	Marked in flexion	Early on sacrum; ultimately enormous, and wherever pressure was made; one patch at level of 4th dorsal vertebra	Excessive general atrophy	Nil on examination	—	Polyuria; normal urine	Œdema of both lower extremities	—	Outside dura	(1) 2 cm. thick, 1 cm. long	Infiltration of 1st lumbar vertebra into tumour (1) pressing into neural canal and on cord at 8 cm. above the filum terminale	Cancer scirrhus	Cervical region showed the white substance to be coloured a dirty grey. Goll's columns were dead white. Patch of softening 1 cm. long in cervical cord, 8 cm. between bulb, especially in left anterior horn and in left lateral column. *Micro. exam.*—Posterior column showed numerous granule-cells, the other columns being normal; in cervical region Goll's column only degenerated and cerebellar tract	Chloral and morphia	Death	Cancer of left breast (primary), liver, adrenal, old broncho-pneumonia	Simon, Berliner klinische Wochenschrift, No. 35, 1870, p. 417.

No. of case.	Sex. age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
			Personal.	Family.	Illness. a. Total duration.	Illness. b. Duration under observation.	Illness. c. Course of symptoms.	Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	a. Relation to dura.	b. Size.	c. Position.	d. Nature.	e. Effect on cord.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Myxoma :																										
21	M. 60	—	—	—	7 years	—	Gradual paralysis of lower limbs	Unbearable	Complete of lower limbs, bladder and rectum	—	—	—	—	—	—	—	—	—	—	In pia mater; slightly adherent to nerve-roots	Olive, 3 cm. long	Growing on cauda equina in the sacral canal; "6 cm. from the lower end of the cauda"	Brownish-white; elastic and white fibrous tissue and nerve fibres. On section resistant in parts, spots yellow ochre in colour; in others soft, marrow-like, with many cysts, millet to size of bean. Cysts contained yellow, gelatinous, amorphous fluid. *Micro. exam.*—Pus-cells granular and fatty. Vessels very numerous; several surrounded with yellow granules and crystalline pigment	None on nerve-fibres	—	Death	None	Benjamin, Virchow's Archiv, Band ii, 1857, p. 67.
22	F. 60	Blow on back with carriage pole 6 years before	—	—	6 years	1 month	After blow could walk for 2 years, then gradual loss of power to walk quickly came on, weakness in the knees and soles of the feet. It seemed as if the knees were suddenly "seized," and as if a cushion was put between the ground and the soles. The loss of power began in the right leg	Very severe	Complete motor paralysis of both lower limbs. Sensation and power over bladder and rectum all present and normal (?) 1 month before death	—	Very frequent and very painful flexion of all parts of lower limbs	Very severe contracture of both lower limbs	Very severe, and rapidly spreading over sacrum	—	—	—	—	—	—	(In arachnoid ?). Between dura and cord, quite distinct from latter. No adhesions	Length was from the highest root of the 2nd dorsal vertebra to that of the 5th dorsal vertebra	Between the 2nd and 5th dorsal vertebra, on the *anterior* surface of the cord	Grey, granular, soft, and vascular, described as "cancerous"	Severe compression from before backwards, so as to crush through the antero-lateral columns, leaving only a strip formed by the posterior columns. (In the microscopical examination it is recorded that there was "almost complete absence of the proper tissue" of the cord)	Counter-irritation to spine by moxas	Death	None	Cruveilhier, Anatomie Pathologique du corps humain, xxxii livraison, figs. 2, 2′, 2″, pl. i.
23	F. 52	Great fright	—	—	2 years 9 months	1 month	Ascribed to severe fright; this at once producing faintness, then loss of consciousness and convulsions (the menstrual flow, which had commenced, was arrested, and never reappeared). On recovery of consciousness on the 3rd day, she had complete motor paraplegia in lower limbs, which were in constant painful tremor (tressaillemens). No affection of sensation then, but paralysis of bladder and rectum. The spasms ceased 18 months later, but the lower limbs became anæsthetic	See Column 8	Complete motor and sensory paralysis of lower limbs and trunk as high as the epigastrium, the anæsthetic area being limited by an *oblique* line (further description wanting). Bladder and rectum paralysed	—	Present, disappeared before death (see History, *c*)	—	Frightfully extensive; whole buttocks excavated	—	—	—	—	—	—	In pia mater, between dura and roots of nerves in the cauda equina	Length 5·5 m., breadth at middle 1·5 m.	Enveloping the apex of the lumbar enlargement and the commencement of the filum terminale	Dark red, soft, nodular, called "encephaloide"	Probably but moderate compression of nerves of cauda equina. The spinal cord for the lower half of the dorsal region, as low as the lumbar enlargement, was greatly softened (diffluent in places), and of a yellow colour. A few normal nerve fibres could be found in it, but the whole thickness of the cord was destroyed (yellow softening?)	—	Death	None. Lobular pneumonia, left lung	Cruveilhier, Anatomie Pathologique du corps humain, xxxii livraison, figs. 1, 1′, 1″, p. 17.
24	F. 35	Parturition of dead fœtus	Always delicate; had had migraine	Good	7 years	13 months	Pains first began after the birth of a dead child, beginning in the right foot and going into right calf; spread to thigh and hip. Pain was pricking and tearing. At same time right leg grew weak, and attempts to walk produced violent clonus in the limb. These symptoms got much better, and in 6 months the patient was apparently well, and remained so for nearly 3 years. Then, without known cause, the menses stopped for 3 months. At this time diarrhœa commenced, which weakened her very much, but no discharge of blood appeared. Of this she recovered, and for 6 months was well. Then there began weakness in the right lower limb, coupled with constant stabbing pain; also paræsthesiæ of deadness, numbness, and formication were felt. In a month the pains were felt in the left lower limb, beginning in the foot and extending to the knee, and to a less degree into the thigh. 2 months later paralysis of both lower limbs was almost complete. This was temporarily greatly alleviated by the use of hot douche baths	Painful girdle sensation at the level of the navel	Absolute motor paralysis of both lower limbs; perception of sensory stimuli only appreciated on the anterior aspects and slightly on inner aspects of thighs, the right worse than the left; upper limbs completely normal. Later both bladder and rectum completely paralysed	Enormously heightened, the least touch causing severe jerks of the legs, &c.	Very powerful twitching in the lower limbs when they were moved; later on severe clonus	Right lower limb contractured in flexion; left lower limb extended	Severe decubitus over the sacrum and thighs, as far as the trochanter	Muscles of right lower limb thinner than those of left	No deformity; great stiffness; later tenderness developed, most at the 1st and 2nd lumbar vertebræ, but extended from the 10th dorsal downwards	—	—	—	—	Between dura and cord, strongly adherent to former, but loosely to latter, except at its lowest point	Length 80 mm.	From the 7th to the 10th dorsal vertebræ, on the right side of the spinal cord, pushing the latter to the left and compressing it	Solid elongated mass, with a small cystic cavity at each end, the upper of which contained some fluid and blood-clot, the cyst wall also being infiltrated with blood. The cysts communicated by a slit-like canal, so that they formed a cavity 78 mm. long and 20 mm. broad. Microscopically it consisted of spindle corpuscles and fibrous tissue, numerous blood-vessels, and here and there patches of pigment and calcareous degeneration	The spinal cord was very congested in the upper half of the dorsal region; at the point of compression it was softened	Strychnine, silver nitrate, pot. iod., baths, electricity	Death	None. Septic nephritis (and pleurisy ?)	Leyden, Klinik der Rückenmarks-Krankheiten, Band i, 1874, p. 454, fig. viii.
25	F. 52	Suppression of menses	Perfect health	—	4 years	—	Illness began with lancinating pains in the abdomen and chest, later in the pelvis and lower limbs, especially the left; the lower limbs became sometimes cold, burning, turgid, very often intolerably painful	Severe pains, which became atrocious, especially when the rigid limbs were moved	Complete motor and sensory paralysis of lower limbs	Apparently exaggerated	Frequent clonic spasm	Often severe	Not noted	Very flaccid and atrophic. 2 months before death left carpus and metacarpus and right knee suppurated (pyæmic ?)	Nil abnormal could be discovered	—	—	—	—	Between dura and cord, from which it was free	Ovoid 2 in. long	Opposite 10th dorsal vertebra, and resting on the posterior aspect of the cord	Tumour was slightly lobulated; firm, pinkish-white, vascular	Softened throughout at point of compression, and partly so for a total length of 2 in. Opposite the broadest part of the tumour the cord appeared cut through; the division of the cord was actually complete	Strychnine and morphia	Death	"Tubercular" disease and cavities of both lungs; old pleurisy on left side; white, firm, band of tissue, fibrous (?), over each lateral lobe	Ollivier, Maladies de la Moelle Épinière, tome 2, p. 477.
26	M. 30	—	—	—	4 months	2 months	Had cough and shortness of breath for 2 months, lost flesh, and sweated much. The cough was accompanied by pain in the upper part of the back and right shoulder. Resp. 24. 6 weeks before death suddenly unable to empty his bladder. Catheterised, and for some time no further trouble. 2 weeks later, pain in right shoulder increased, and feeling of weakness came on, as well as rigors and sweatings. Next day knees painful, and patient was unable to stand; bladder became paralysed, and anæsthesia of lower part of body as high as 3rd rib. Margin of anæsthesia ill defined. Slight paresis of arms	Pain ultimately severe, and referred to the right shoulder	Complete motor paralysis of lower limbs, bladder, and rectum; analgesia complete, but localisation of touch remained	—	—	—	Large sacral slough	—	Nil on examination	—	Ammoniacal and bloody towards end	—	—	Growing on the inner surface of the dura	Hazel nut	Attached to the anterior wall of the theca, opposite the 1st dorsal vertebra	Myxoma (?). "Nucleated cells and free nuclei in a shiny albuminous blastema"	The spinal cord was softened for ¾ in. opposite the 1st dorsal vertebra; it extended through the cord, and "the anterior parts" did not seem "more affected than the posterior"	Cod-liver oil and anti-rheumatic	Death	Recent pneumonia; no chronic disease of lungs; septic cystitis and pyelonephritis	Gull, Guy's Hospital Rep., 2nd series, vol. ii, 1856, p. 145.
27	M. 41	Drinking cold water when heated; laborious work	Good, but intemperate	Good	5 years	14 days	Began with cough and pain in left side. 3 months' rest; then work brought on pain in back and left loin, and difficulty in walking; this for 6 months. Coldness in legs and loss (occasional) of sensation; increased pain in loins and inability to stoop; loss of power in left leg; right affected 6 months later. Both frequently twitched and jerked. Sphincters became weak	Constant in back and left loin; tenderness in both hypochondria	Complete motor paralysis of both lower limbs, bladder, and rectum. Complete anæsthesia in right lower limb, except along the "posterior part of tibia." Incomplete in the left lower limb, and as high as the crests of the ilia	Exaggerated	Severe and frequent	—	—	General atrophy of body	Nil on examination	—	—	—	—	Between the dura and the cord	About 2¼ in. long, ⅞ in. wide, and ⅓ in. thick	Opposite the 7th and 8th dorsal vertebræ, pressing in the pia mater on the dorsal surface of the cord	Fibro-myxoma, soft yellowish. *Micro. exam.*—White fibres, elongated and round nuclei, loosely held together by granular blastema	Compressed and flattened, but "entire"	—	Death	Pneumonia and pleurisy; nil else	Gull, Guy's Hospital Rep., vol. ii, 1856, p. 151.

No. of case.	Sex, age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
					Illness.																							
			Personal.	Family.	*a.* Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.	Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Myxoma (continued):																										
28	M. 37	None known; blow on head some years previously	Good. No history of syphilis	One brother died of phthisis; otherwise good	4½ years	6 months	Illness began with pricking pain in 5th intercostal space, just inside the nipple. In a month it was severe and stabbing; for 3 years it continued; then great pain in walking and stooping. Next the legs swelled, and left gradually became numb, this spreading up from foot. Ataxia, spasmodic flexion, constipation, and difficulty in micturition	Severe boring pain in mid-dorsal (5th) region, radiating into the left axilla. Occasionally (later) the pains shot down the left thigh. The girdle sensation was marked at the level of the 5th intercostal space; became later very severe, and accompanied spasms	Motion.—*Left lower limb.*—Complete save movements of toes, slight such persisting. *Right lower limb.*—Could flex and extend all joints but feebly. Later complete motor paralysis of both lower limbs. Sensory.—*Tactile.*—Anæsthesia as high on left side as 8th rib; as on right as high as Poupart's ligament; hyperæsthetic zone as high as 5th rib, above the zone of anæsthesia. *Analgesia.*—Right side, as high as middle of thigh; left side, as high as margin of ribs. *Temperature.*—Not distinguished on either side below umbilicus level	Deep.—*Knee-jerk.*—Increased at first, especially left; later lost. Superficial.—*Plantar* present and exaggerated throughout. *Cremasteric and abdominal* absent. *Epigastric* present; later absent	Ankle-clonus in left foot; later lost, and then reappeared in both feet, returning in left first. Later frequent spasmodic twitchings in both legs	Frequent in flexion	Sacral and over hips, 1 foot wide; also over left groin, thigh, both shins and heels	No sign of wasting; some diminution of response to both currents; later general emaciation	No deformity, but tenderness in mid-dorsal region	Normal	Towards end ammoniacal	Both lower limbs swelled	—	Within the dura, and separate from it and the cord	Length 1 in., thickness ¼ in.	Lying on posterior column of cord, and involving the left 5th dorsal nerve; the nerve was red, swollen, infiltrated with growth	Myxo-fibroma; bluish colour, cystic	Cord "completely disorganised." Degeneration noted above the seat of tumour in the posterior median, the direct cerebellar and ascending antero-lateral tracts, below in the crossed pyramidal tracts on each side. Congestion of posterior cornua of the grey matter	Blisters, iodide of potassium	Death	Nil else	Bruce and Mott, Brain, Part xxxviii, 1887.
29	F. 35	—	—	—	2 years 2 months	2 weeks	Weakness in both lower limbs, with spasms and violent pains; ultimately complete motor paralysis; no loss of sensation. Improved state for short time by moxas to spine. Pains recurred in hypogastrium and lower limbs	Pains were very severe. Incessant pricking in lower limbs and abdomen, ultimately preventing sleep	*Motor* paralysis complete in lower limbs; paralysis of bladder and rectum. A few days before death the sensibility of the lower limbs appeared to be a little diminished	—	Frequent spasms	Excessive in flexion	—	Legs were wasted	Nil on examination	—	—	—	—	Within dura, and separate from it and the cord	Length 2 in., breadth 8 in.	On left side of posterior surface of cord, at the level of the 2nd dorsal vertebra, the upper end was lodged between the anterior and posterior roots of the 2nd dorsal nerve	Growing in the arachnoid: lobular, whitish, numerous vessels; fibrous capsule enclosing whitish soft tissue; olive shaped	Spinal veins and cord vessels much congested, especially below; excess of cerebro-spinal fluid. The cord was diminished one third at the point compressed, and also somewhat softened	Moxas to spine	Death	Nil else	Hardy, Archives Générale de Médecine, 1° série, tome v, 1834, p. 229.
30	M. 35	—	—	—	—	—	Patient had pain in back, and paralysis of all limbs, from which he recovered. Soon after he again felt burning pain in the back, and again complete paraplegia, including bladder (and rectum?)	Burning pain in back (of neck?)	Complete paralysis	—	—	—	—	—	—	—	—	—	—	Inside dura	Almond	On left side of the cord, between the roots of the 4th and 5th cervical nerves	Bluish oval tumour	Cord beneath tumour was infiltrated with blood, especially in the posterior column	—	Death	—	Albers, Atlas, plate xxx, fig. 1; text, p. 31 of description of plate, 1832—1847
31	M. 19	Chill after severe exertion	Strumous glands all childhood. "Inflammation of brain" at 10 years, which began with severe headache, and disappeared in 2 months. Subject subsequently to recurrent headaches. Intermittent fever at 12 years, after a chill; this lasted 4 months. Well after till 18 years old	—	19 months (?)	—	After prolonged and severe exertion (at Easter, 1859), in which he became over-heated, patient exposed himself to a draught. Next day he felt ill; heavy, dragging pains in small of back, and headache. 2—3 days later felt stitch in left hypochondrium, which was made so much worse by movements of the arm and deep inspiration that patient had to move about in bent position. However, he worked. 8 days after beginning of illness a doctor ordered cupping and rubbing to side. Pain grew worse, and patient was confined to the house. Another doctor ordered "bitter tea," which patient took for a month. Pain passed further to scars of moxas, which had been applied. These were very sensitive. No motor paresis. Pills, plasters and blisters were applied to the back, with no result. On the onset of cold weather in autumn, patient felt numbness in the soles of both feet. Suddenly one day both knees flexed as he stood, and after that he dragged the right foot (he could move it freely, but not stand on it). Sensibility began to diminish (in both ? legs), while the pain remained unaltered. In winter tenderness over the 1st and 2nd lumbar vertebræ was made out. Ordered foot-baths, ointments, &c. Right lower limb became completely paralysed, and anæsthesia increased. At same time the left lower limb began to pass through the same stages. Moxas and blisters repeated till Sept., 1860. Complete paraplegia, involuntary twitchings of lower limbs, and flexion of same, with wasting, having developed, patient was admitted to hospital	Very marked. On sitting down and getting up the patient felt pain deeply in the abdomen, to the left of the middle line	Complete motor paralysis of lower limbs; diminished sensory perception in lower limbs; deep parts algesic; also diminished over the abdomen up to the umbilicus. Almost complete paralysis of the bladder. Perception of sensation improved later for some time, but localisation was constantly defective	Superficial, exaggerated; abdominal reflexes absent	Marked clonus on excitation; frequent spasms	Both lower limbs extremely rigid in extension	Very severe for 2 months before death, and painful	—	When the patient was raised by lifting him under the armpits, the spine appeared somewhat bent to the *right*, the flexion appearing to occur in the lower dorsal vertebræ; the spines of these vertebræ also were less prominent than those of the lumbar vertebræ. The spines of the first two lumbar vertebræ were tender on pressure. Later the curve became well marked, and extended from the 8th dorsal to the 1st lumbar vertebra	—	—	—	—	Inside dura, between it and cord, attached to former; dura bulged	Pigeon's egg; 1 in. long, ¾ in. broad, ⅝ in. thick	Opposite the 10th and 11th dorsal vertebræ, and more adherent to left side of theca	Myxoma. The growth was markedly cystic; the walls of the cysts were formed of greyish tissue, showing tendinous and yellow streaks. The surface was covered with a thin vascular membrane	At point of compression cord was much thinned and softened, being greyish and semi-translucent. The anterior columns remained intact, but the posterior and lateral columns, together with the posterior cornua of grey matter, were converted into a jelly-like translucent mass, in which could be seen a few vessels and remains of the white fibres; both sets of nerve-roots were atrophied. Below the seat of compression the cord showed slight hyperæmia of the grey matter, and in a similar state just above the tumour, but 1½ in. above the latter the cord seemed normal	Moxas, &c.	Death	—	Traube, Annalen des Charité Krankenhauses zu Berlin, 1861, p. 143.

INTRADURAL GROWTHS—*continued.*

			History.					Symptoms.												Tumour.								
					Illness.																							
No. of case.	Sex, age.	Alleged cause.	Personal.	Family.	a. Total duration.	b. Duration under observation.	c. Course of symptoms.	Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	a. Relation to dura.	b. Size.	c. Position.	d. Nature.	e. Effect on cord.	Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Myxoma (continued) :																										
32	M. 42	Wrench of back	Good	—	3 years	3 years	Gradual development of intermitting pain; then paralysis of left lower limb, then right, &c.	Agonising	Complete motor and sensory, also bladder and rectum	Exaggerated highly	Very severe	Very marked, usually in extension	Commencing	General emaciation	Tenderness on percussion, and lateral curvature	Normal	Purulent	None	None	Inside dura	—	Between the 3rd and 4th dorsal nerves, on the left side of cord	Myxoma (?)	Severely indented, probably with ascending and descending degeneration	Excision of growth	Recovery	—	Gowers and Horsley, Med.-Chir. Transactions, 1888.
		Sarcoma :																										
33	F.	—	—	—	—	—	—	—	Complete of both lower extremities, bladder, and rectum	Not observed	—	—	Diameter 8 in. over sacrum; inner side of both knees, on feet, and inner sides of heels	Thigh-muscles, fatty degeneration; atrophied; leg scarcely altered	—	—	—	—	—	Between pia mater and cord, quite distinct from latter	Bean	Between 7th cervical and 1st dorsal vertebra	Sarcoma	Grey degeneration; glassy grey at periphery, congested, with slight vascularisation	—	Death	None; fatty degeneration of organs	Meschede, Deutsche Klinik, 1873, No. 32, p. 293
34	F.* 25	—	Had 3 children; menses not reappeared since last confinement	—	1 year	5 months	Illness began with pains in pelvis and in the left leg, and general malaise. The pains began in the right leg. Next both legs became weaker	—	Both lower limbs showed almost complete motor paralysis; no affection of sensibility. 5 months before death bladder paralysed; 5 months before death sensation diminished and pain increased; 1 month before death motor and sensory paralysis absolute	Normal	—	—	Decubitus established 5 months before death. This ultimately opened the spinal canal near the 5th lumbar vertebra	None on admission	—	—	Normal at first, became foul 1 month before death; dark brown, black, horribly fetid and purulent	—	—	In the pia mater, between the dura and the cord, from both of which latter the tumour was distinct	8 cm. long, 1·9 cm. broad, 1·5 cm. thick	The growth compressed the filum terminale; few nerve-roots, ante and post, of both sides involved in the mass	Spindle-celled fibro-sarcoma; yellowish white colour	The cord was not affected by the pressure of the tumour. There was well-marked ascending degeneration throughout the posterior columns in their whole length (*i. e.* in the lumbar region the whole section of the posterior columns, but in the upper dorsal and cervical enlargement only Goll's columns were affected). The degeneration was traced up into the funiculi graciles	—	Death	None, save effects of pyæmic infection from the decubitus and decomposition of urine	Simon, Archiv für Psychiatrie und Nerven Krankheiten, Band v, 1875, p. 114.
35	M. 40	—	Had had lead colic several times	—	—	—	Gradual onset	—	Incomplete paralyses	—	—	—	—	—	—	—	—	—	—	Between dura and cord in pia mater and arachnoid	Peas	Scattered all over the cord and base of the brain	Melanotic sarcoma	Not noted	—	Death	—	Virchow, Die Krankhaften Geschwülste, Band ii, p. 120.
36	M. 51	Fall or blow on spine	Publican, drinker, and had had syphilis	—	17 months	3 days	Illness began with vaso-motor changes in right upper limb (see column 19) followed by paralysis of the limb; 3 months later numbness, &c., felt in right leg, arm, &c., followed by vaso-motor changes in the hip, and, finally, whole lower limb; 7 months after onset observed in left side same symptoms. Complete motor paralysis rapidly set in, and at the same time sensory paralysis also. Later began painful spasms in all the limbs, especially in the legs	Painful spasms; towards the end of life boring pains were felt in the vertebræ, opposite the spine of the scapula, and higher, finally settling about the 8th or 9th dorsal vertebra	Complete motor and sensory paralysis of all four limbs; paralysis of bladder and rectum; commencing dyspnœa; expiration difficult. The larynx descended with inspiration	Plantar reflex weak	Painful spasms in all limbs, especially in the lower limbs. These were rapidly flexed, and then gradually sank again	The right lower limb, after the spasms, became contractured, and, later, the left lower limb	Not recorded	—	No pain on pressure; nothing abnormal discoverable	—	—	Redness and swelling of the right shoulder. Later whole arm and hand swelled and reddened. Repeated in right hip, and, ultimately, whole lower limb. Repeated later in left side in the same order	—	Grew from inner surface of dura, and pressed upon cord, but was quite distinct from this latter	Pigeon's egg	3½ inches below the lower border of the pons	Sarcoma	From the 7th cervical nerve upwards to the bulb the cord was softened. The grey substance was reddish. Where directly pressed upon by tumour (see column 23) the cord is completely diffluent	—	Death	None	Traube, Gesammelte Beiträge zur Pathologie und Physiologie, Band ii, 1871, p. 1012.
37	F. 28	Fit of anger	Good	Good	1 year	1 month	Illness began with pain in the right side of the body, between the epigastrium and the spine; a little later it attacked the left side of the body; considered hysterical. Next paresis of lower limbs. Complete paralysis 5 months from onset; paralysis of bladder and rectum	Excessive pain, especially at the base of the thorax, towards navel and epigastrium, shooting into the legs and thighs	Complete motor and sensory paraplegia of lower limbs, bladder, and rectum	Excessive till just before death, when diminished	Marked	—	Sacral	General emaciation	—	—	—	—	—	Inside dura; growing within arachnoid, separate from cord, and only slightly adherent to pia mater	5 or 5 cm. long, 1—2 cm. broad	15 cm. above the lower end of the cord; pressing on the right side of the cord	Oval, elongated form, with soft tailed extremities; fibro-sarcoma (?) *Micro. exam.*—Round- and spindle-cells	The portion compressed was softened and altered through its whole thickness. There was also ascending and descending degeneration well marked. Meninges over cauda equina; lumbar enlargement inflamed and suppurating	—	Death	Nil; pyæmic foci in the lungs	Lancereaux, Atlas d'Anatomie Pathologique, 1887, p. 447.
38	M. 65	Lying on damp grass	Good, save a kind of fever in early life without sequelæ	—	9 months	5 weeks	On waking after exposure to cold felt so paralysed in legs that patient got home but slowly; at same time formication and acute pains in legs, which gradually crept up from the ankles up to the lower half of thorax	Severe in lower extremities	Complete motor and sensory paralysis, as high as lower half of thorax, the attachments of which were sensitive	Very weak	Tremor	—	Sacral	Atrophy of lower limbs, and, later, of whole body	Nil, in examination	—	Normal	—	—	In cord	—	In middle 3rd of cord	Sarcoma (?)	In middle third of cord there were two hard tumours of same nature as the growth in the vertebræ, ? sarcoma	Tonics, strychnia, amaris, and bathing the whole body	Death	Infiltration of all vertebræ with sarcoma (?) tissue; also some pelvic bones, bladder, and prostate; hydrothorax	Vogel and Dillmar, Deutsche Klinik, No. 28, 1851, p. 303.

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* One month before death this patient gave birth to a living child. The labour was normal.

No. of case.	Sex, age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
			Personal.	Family.	Illness.			Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.				
					a. Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Sarcoma (continued):																										
39	F. 30	Wet and cold	Good	—	7 years	9 months	After exposure to wet had general joint rheumatism; cured in 4 weeks. A year later began severe pain in back, at 5th dorsal vertebra, shooting into breast. Became pregnant (for 3rd time; when 6 months so felt sudden weakness in left lower limb, which subsequently frequently gave way. The motor paresis continued and extended to the right leg also, and ultimately to the bladder and rectum 4 years and more before death. Improvement so that patient could bend and extend the limbs. Similarly the bladder and rectum recovered; 2 years before death symptoms returned	Severe and frequent; referred always to the 5th dorsal vertebra	*Motor paralysis* complete in lower limbs and distal segments; incomplete in proximal parts, *e. g.* hip and knee. *Sensory paralysis* only apparent shortly before death. Paralysis of bladder and rectum	Superficial, excessive, finally lost	Very frequent spasms; marked clonus of both lower limbs, this terminating in flexion rigidly	Very marked in flexion	Severe; death from pyæmia	Well nourished	Nil on examination	—	—	—	—	Within dura, adherent to it and arachnoid ligament denticulatum by loose tissue	Length 27 mm., breadth 15 mm.	On anterior surface of cord, opposite the 2nd dorsal vertebra	Reniform, covered with vascular arachnoid and pia mater (?). Tumour substance was greyish, and excavated by two small cysts, the walls of which were brownish red tissue, and contained a sticky fluid, in which were leucocytes. *Micros. exam.* showed tumour to be composed of numerous and various shaped corpuscles and fibrous tissue, termed by Baierlacher a cysto-sarcoma	*Cord* was considerably atrophied at seat of pressure	Issues and baths	Death	—	Baierlacher, Deutsche Klinik, Band xii, 1860, p. 295.
		Fibroma:																										
40	F. 25	—	Chlorosis 5 months at 20 years	*Father*, aneurism of aorta and gout, nil else	—	—	Tearing, "gouty" pains for 2 years, beginning at 4th cervical vertebra, extending to arms and feet, especially in joints; intermittent; worse at night; usually accompanied with spastic flexion or extension. Œdema of foot then appeared. Could not walk. Improved in winter, and could work a little; worse in autumn of following year	Twitching, tearing pain, reaching from ankles to hips, then to upper limbs, and, arriving here, the feeling of contraction was accompanied by a bending inwards of the little finger. When legs placed to ground they sank, but then rapidly extended, and then came on burning pain like boiling water poured down them	Complete of lower limbs, gradually involving upper ditto. Later paralysis of bladder	—	Violent flexion, especially of finger (little ?)	Of hips	—	—	Tender from 1st to 4th cervical vertebra; slight curve to the left	—	—	—	Occasionally	Pia mater directly on cord	Hazel nut	Between 4th and 5th cervical vertebræ	"Connective tissue; Faserzellen; attached and free nuclei." "Partly fattily degenerate in its interior"	Columns of cord are "thinned, pushed to one side, compressed." More than normal amount of cerebro-spinal fluid	For neuralgia, with improvement of pain by counter-irritation. Later cold douche to spine	Death	None. Œdema of lungs	Bernhuber, Deutsche Klinik, 1853, No. 37, p. 406
41	M. 35	Heat and chills	Measles and intermittent fever	Parents healthy	7 years 1 month	4 months	Powerful pain at night in dorsum of upper third of right forearm; no tender point. Pain recurred constantly at night. After nearly 7 years the pain spread into hand, movements of which caused much pain. This extended to shoulder, between shoulder blades and into lower cervical vertebræ. Next, the last three fingers of right hand, and, later, the last three fingers of left hand, became very painful. Paræsthesiæ of all kinds felt in these fingers. Later the right three fingers could not be flexed or extended well, and, ultimately, the right upper limb became weak; next, the right lower limb. Paræsthesiæ in right lower limb, especially of cold; next, pins and needles in left lower limb and cold paræsthesiæ in both thighs. Subsequently, girdle sensation in abdomen	Pain in dorsal aspect, especially of right three last fingers; worse at night, burning. Also deep stabbing pains in arms and in right shoulder	Weakness of right upper limb; almost complete paralysis of right fingers. Paresis of flexion of right knee, increased gradually to almost complete paralysis of upper limbs, to complete anæsthesia below the 3rd rib, and incomplete to clavicles	Completely absent over paralysed limbs. *Note.*—Never any hyper-excitability of reflexes	—	No contracture	Sacral decubitus, as large as the hand and moderately deep	Wasting of muscles of right forearm, 3rd and 4th interossei and thumb muscles. Reaction to Faradic current diminished and abolished according to the degree of wasting. *P.-M.*—The affected muscles were atrophied and pale, especially those of the ulnar side of the forearms, and these contrasted with the dark red supinator longus	No deformity. Nodding flexure of spine diminished. No pain at time of movement, but afterwards; 7th cervical spine tender on pressure and after movement of neck. This towards death. Just before death there was tenderness between the 5th and 6th cervical vertebræ, only obtained by severe pressure, &c.	Normal; dilated	Ultimately, 6 months before death, urine became ammoniacal; cystitis followed	Right hand warmer than left. Both lower limbs became œdematous. Skin shining, yellowish in places, red in others	—	Grew from arachnoid, and was separate from the cord, except at the highest point of compression	Length 30 mm., breadth 12 mm.	Between 4th and 5th cervical nerves, adherent to the former and overlaying the right posterior and lateral columns	The growth was a small fibrous sac, which was opened in removing its attachment to the dura. Granulation-like projections from the pia mater partly filled the cavity. *Micros. exam.*—Growth was simply a mass of connective tissue, with here and there a little calcareous degeneration	The cord was much compressed by the growth, which caused an indentation in the lateral column, the cavity being directed towards the right. At this point the cord was greatly softened, and the softening extends further downwards for 4·3 cm. The pia mater was pale when compressed, but red and congested in the neighbourhood of the pressure as far as the 7th cervical nerve	Narcotics, leeches locally, and Ung. Hydrarg.	Death	None	Leyden, Klinik der Rückenmarks Krankheiten, Band i, 1874, p. 450.
42	F. 53	Fatigue and anxiety	Good general health	—	5½ years	Whole period	Neuralgic burning pains centred in loins, whence spreading down right sciatic nerve. Symptoms gradually progressed. The spasms and pareses noted in columns 12 and 13 began about 3 years before death	Excessive burning pains. Worse on movement and change of weather. All pain of this neuralgic kind disappeared a few months before death	Complete motor paralysis; almost complete sensory	Exaggerated (?)	Very frequent and severe	Very severe; legs flexed on abdomen	Very severe over the sacrum and trochanters	None noted	None noted	—	Normal at commencement	Elastic œdema about the waist, lumbar region, and neck; coming on as the paroxysms of pain decreased. This disappeared a few minutes before death	—	Dura noted to bulge from the 9th dorsal vertebræ downwards for 2 inches, tumour growing in pia mater	Length 1½ inches, breadth ¾ inch	Anterior surface of right half of cord opp. the disc, between the 9th and 10th dorsal vertebræ	"Fibro-nucleated," "rather soft;" excess of cerebro-spinal fluid	The right half of the cord was "so compressed and atrophied as only to form a thin layer of nervous substance;" the left half was similarly compressed, but by no means to the same extent	Actual cautery; freezing to spine. Turpentine, nickel, carbonate of iron, opium	Death	None; organs fatty	Bell, Edinburgh Medical Journal, vol. iii, 1857, p. 331.
43	F. 43	Exposure to cold	Good health before	—	10 months	4 months	With pain between the shoulders and in the chest, and in a few days pains in legs; gradual motor paraplegia. Pain increased and spasms began about 4 or 5 months after commencement	Very severe; paroxysmal burning and accompanying spasms, affecting abdomen and lower limbs	Never absolute, but nearly so; affected lower limbs only. Sensation unimpaired. Ultimate paralysis of bladder and rectum	Increased (?)	Severe in abdomen and lower limbs	Severe in flexion	Extensive	Atrophy	"No deformity" (Gull, *b. c.*)	—	—	—	—	Between dura and arachnoid, separate from the cord	Large bean	Growing in the arachnoid, on the inner surface of the dura; pressing cord back against the laminæ of the vertebra, opposite the 2nd and 3rd dorsal vertebræ	Fibroma (?) firm, hard, slimy; few blood-vessels, white fibres, and oval nuclei	The cord was flattened at seat of growth, and here contained "a number of fatty granules and granular masses"	Blisters	Death	Nil, save septic condition of urinary tract, fatty liver, and slightly fibroid uterus	Wilks, Trans. Path. Soc., vol. vii, p. 37.

No. of case.	Sex age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
			Personal.	Family.	Illness.			Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupil.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.				
					a. Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Fibroma (continued) :																										
44	F. 40	Began after confinement	Good health before	—	2 years	—	Began with imperfect paraplegia after confinement, which was attended with severe pain along the spine. Motor paraplegia. Very little sensory ditto. Treated 3 months; went out able to walk. Pain continued. Next year internal hæmorrhage, increased pain in back, and motor paraplegia	Very severe proxysmal	Complete motor paraplegia of lower limbs. Paresis (slight) of upper limbs. Paresis of sensation and of lower and upper limbs	Excessive	Severe in lower limbs	Severe in flexion	Huge sores, exposing sacrum, trochanters, &c. (Death from pyæmia)	—	Tenderness on percussion	—	Early alkalinity and vesical catarrh; late severe cystitis	—	—	Between dura and cord, slightly adherent to dura and cord	1 inch long, ½ inch thick	On right side, partly surrounding cord, extending from the left of the anterior median fissure, nearly to the posterior median. Nerve-roots stretched over it	Round, nodular, whitish, dark in places; interior cystic. The cavity =½ the tumour. Walls of cysts whitish, elastic, soft; outer surface covered with thin fibrous tissue, inseparable from growth. Fluid in cyst was greenish brown, and showed through in thinner parts of tumour. *Micros. exam.*—Fibroma. Vascular fluid contained numerous blood-corpuscles of very irregular shape. Crystals of triple phosphate also found	Cord compressed	—	Death	Nil	Risdon Bennett, Trans. Path. Soc. of London, vol. vii, 1856, p. 41.
45	F.	Damp dwelling	Good	—	1 year	1 month	Illness began with violent pain in shoulder-blade and breast. The whole right side became tender; impossible to lie on it. Six months later rigor, fever, &c., after which pain diminished but loss of power came on; patient confined to bed; cough developed; 3 months before death numbness in right lower limb, and, later, paralysis, formication, and twitchings in the same. Same symptoms appeared in the left leg, so that ultimately there was complete motor and sensory paraplegia. The anæsthesia extended over the abdomen. Painless parturition occurred	Preferred to lie on left side. Girdle pain in region of the stomach. Pains, intermittent, ran from interscapular region through the breast, and accompanied the twitchings and contracture of the lower limbs	*Motor.*—Complete paralysis of both lower limbs, as high as epigastrium. *Sensory.*—Complete paralysis as high as the xiphoid (?). *Paralysis of bladder and rectum*	Excessive	Frequent	Marked flexion	Large bed-sore	General emaciation	Uppermost dorsal vertebræ; tender on pressure, especially Nos. 1, 2, and 3. Also the same tenderness on the right side of the spine, extending to the right scapula. The pain, on pressure, extended into the side	—	—	—	—	Within the dura, growing from the arachnoid	Length 35 mm., thickness 15 mm.	On right side of cord, arising between the 2nd and 3rd dorsal nerves	Of an elongated, flattened egg shape. Tumour was enclosed in a fibrous capsule, was of a greyish white colour, with a cauliflower-like surface. *Micros. exam.*—Fibrous tissue and flattened corpuscles	Cord perfectly healthy where compressed; excess of cerebro-spinal fluid	—	Death	Tubercle (?) in both lungs; septic cystitis, pyelonephritis, &c.	Malmotte, Schmidt's Jahrbucher, Bd. 114, 1862, p. 302.
46	M. 69	Probably fall on back many years before	Extremely vigorous man, naval officer, long service, West Indies, African coast, and elsewhere; had yellow fever in Jamaica, African fever and syphilis,	Very good	8 years, 6 very severe	8 years	Yearly aggravation, with no *real* intermission, though occasional relief	Pain on *left side only*, at first lumbar, then abdominal, then inguinal, lastly femoral, in *anterior* and *outer region* only; most intense in course of external cutaneous nerve and its branches, commencing superficially just below the superior anterior spinous process of the ilium, and spreading down the outer surface of the thigh; extension of pain to abdominal or inguinal regions or to scrotal region occasional. Pain intense, excruciating, darting, and accompanied, when severe, with muscular twitchings, or actual spasms of muscles of outer side of thigh. Pain latterly never entirely absent	No loss of muscular power or sensibility	Not observed	See No. 9	None	None	Slight wasting, latterly general	Nothing noticeable; no special *local* tenderness	Not observed	Lithates always present in excess; phosphates; no albumen or sugar	—	—	Between dura and pia mater, separate from both	Oval, long, broad	On left side of cord, apparently opposite the origin of the 1st lumbar (?) nerve (7 cm.=2¾ in. above the tip of the cord), the posterior root of the 12th dorsal (?) nerve being stretched over it	Nodular, hard, contains hard granules, covered with thin capsule, substance reddish. *Mic. exam.* showed growth to be a calcifying fibroma, with a little myxomatous tissue	Cord was very slightly excavated opposite the centre of the growth, and slightly swollen (?) above this point	Fomentations, blisters (opium and belladonna applications), baths, antacid medicines (colchicum, chloroform, conium); finally subcutaneous injections of morphia. Division of external cutaneous nerve, where it escaped through fascia lata under chloroform; apparent relief for a few days only. *Diagnosis.*—Finally I was driven to the conclusion of *tumour*, or exostosis, in the canal pressing on to the *sensory* roots of a lumbar nerve. *Treatment.*—I over and over again discussed the question with the patient of opening the spinal canal; but in the period of *septicity* the risks seemed to preponderate over the *chances* of finding a tumour, and I did not ever seriously urge it on my old friend	Fatal issue, thought to be due to long-continued pain. *Morphism.* Symptoms of cerebral anæmia and general exhaustion	See tumour. Bodily organs all anæmic. No marked change, except fatty degeneration	Not published. From private information very kindly supplied me by Mr. John Marshall, F.R.S., &c.
		Psammoma :																										
47	F. 34	None, but first symptom appeared 2 months after last confinement	Perfect general health	—	1 year	14 months	First felt pain in her right foot, extending up to thigh; at same time loss of power began. 2 weeks later similar symptoms began in left leg. In 2 months complete paraplegia	Commencing symptom severe, referred to legs	Complete motor paralysis of legs, and paresis of arms; later, paralysis of bladder and rectum; hyperæsthesia of both lower limbs	Exaggerated	Very frequent and severe	Severe; legs flexed on abdomen	Large bed-sore on the *left* buttock	None whatever	—	—	—	—	—	Between dura and cord, growing from internal surface of dura	Length 1¼ in., breadth ¾ in.	6th and 7th cervical vertebræ; between 6th and 7th cervical nerves, on the left side of the cord	Psammoma (?); white, lobulated, with a stroma of delicate fibrous tissue, enveloping masses of corpuscles; in places spherical calcareous masses, &c.	The growth pushed the cord to the right, and and at the same time caused a deep depression in its left side; the cord, where compressed, was thinned, but not softened	Blister, biniodide of mercury and cinchona bark	Death	None whatever	Whipham, Trans. of the Path. Soc. of London, vol. xxiv, 1873, p. 15.
48	F. 46	—	—	—	1 year	2 months	The symptoms began with the iliac pain, worse at night; 6 mos. later formication in the lower extremities, and girdle sensation, referred to abdomen; this followed by gradual paresis in legs, especially the left	Fixed pain in left flank, worse at night	Complete motor paraplegia; also sensory paresis, ultimately complete in left leg; complete paralysis of bladder and rectum	—	Occasional spasms	—	Bedsores	—	—	—	—	—	—	Between the dura and cord, and separate from each	Oval; length 1¼ in., thickness $\frac{5}{12}$ in.	Growing from the arachnoid; the growth was situated between two nerves on the left side of the cord, and compressing the posterior and lateral columns; the tumour lay opposite the 10th and 11th dorsal vertebræ	(?) Psammoma; white, very soft. *Micro. exam.*—Nucleated fibres and corpuscles, the latter arranged in concentric rings, the centre of which was occupied by a group of nucleated cells and nuclei; many were filled with a shining mass, soluble in acetic acid; (?) calcified	Cord was much compressed, and its left side was hollowed out by the tumour; its substance was reduced to a soft white pulp; above and below the cord was normal	—	Death	Nil. Body very fat. Septic cystitis and pyelonephritis	Cayley, Trans. Path. Soc. of London, vol. xvi, 1865, p. 23.

			History.					Symptoms.												Tumour.								
					Illness.																							
No. of case.	Sex, age.	Alleged cause.	Personal.	Family.	*a.* Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.	Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.	Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Psammoma (continued) :																												
49	F. 61	—	—	—	6 years	1 month	Illness began with weakness in legs, gradually complete paralysis	—	Complete motor paraplegia of lower limbs; incomplete sensory ditto; complete paralysis of bladder and rectum	—	—	Very marked in flexion	Sacral	General atrophy of body	—	—	—	—	—	Inside dura, growing from ligament denticulatum, separate from dura and cord	3 cm. long; oval	Mid-dorsal (?), left side	Psammoma; very firm, oval. *Micro. exam.* showed concentric hard bodies which dissolved in acid	The cord was pressed to the opposite side, and rolled over somewhat, so that the anterior surface was turned to the same side; the cord softened and of a deep red colour for a distance of 2 or 3 cm., being most affected opposite the centre of the tumour	—	Death	Nil else	Lancereaux, Atlas d'Anatomie Pathologique, 1871, p. 444.
50	F. 63	—	—	—	About 5½ years	4 months	Gradual weakness in left lower limb, with arthropathies; after severe mental shock the right lower limb became affected; walking and standing became impossible	Very severe. Referred to left side of chest and loins and left lower limb, and described as like a dog gnawing the bone; increased by slightest movement of lower limbs. Paroxysmal	Right lower limb: all movements possible, but very feeble; complete anæsthesia of this limb; no paræsthesia. Left lower limb: absolute motor paralysis, but hyperæsthesia and hyperalgesia	Exaggerated	Clonic spasms, started in left lower limb easily by reflex irritation	Right lower limb rigid in extension; left limb ditto. Later both limbs flexed and adducted	Frightfully extensive: sacral-trochanteric, knees, malleoli, toes, &c.	No wasting	Tenderness on pressing; at the sides of the dorsal spines no localisation possible	—	Purulent and bloody	Œdema of both lower limbs	—	Inside dura, between it and cord	Ovoid. Length 3·5 cm., breadth 1·5 cm.	(?) Between 8th and 9th dorsal vertebræ, on anterior surface of left antero-lateral column, 5 cm. above the broadest point of the lumbar enlargement	Psammoma. Tumour was encapsuled in a thin fibrous sheath; substance whitish and soft. *Micro. exam.* showed characteristic globes, consisting of flattened cells saturated with salts	The left half of the cord was severed, crushed, and excavated by the growth, which pushed the median sulcus to the right and backwards. At the seat of compression the cord was softened, grey, and gelatinous. *Micro. exam.*—This part of the cord showed numerous nuclei and Deiter's corpuscles (?), connective tissue, few fibres and axis-cylinders, nerve-cells, most normal, others globose and without branches, granular corpuscles, &c. Above the growth there was ascending degeneration in the posterior column, most marked on the right side; below these was descending degeneration (grey) in the posterior part of the lateral columns; also most marked on the left side	—	Death	Pyelonephritis; nil else. The knee-joints contained a large quantity of synovia. The interarticular cartilages were yellowish; nil else	Charcot, Archives de Physiologie, tome ii, 1869, p. 291.
Tubercle :																												
51	12	—	—	—	1 year	—	Began with the convulsions	—	—	—	Occasional convulsions, affecting specially the arms; became more frequent, and were accompanied by loss of consciousness "Chorea"	—	—	—	—	—	—	—	—	Between the dura and arachnoid	Nut	Opposite the 3rd cervical vertebra	Tubercle	Cord compressed. Nil else mentioned	—	Death	Tubercular phthisis	Communicated by Gendrin to Ollivier, Maladies de la Moelle Épinière, tome ii, p. 502.
52	F. 23	Mental shock	—	—	6 weeks	5 weeks	Began with "low fever," and then the symptoms of Addison's disease began. The first nerve symptom was inability to "command the left arm." Then followed choreiform movements in the left arm and leg, and these twitchings subsequently became general	—	—	—	—	—	—	—	—	—	—	—	Present (? due to Addison's disease)	Within dura	Haricot bean	Grew from the centre of the cord, and spreading backwards into the posterior fissure, reached the posterior surface of the lumbar enlargement	Firm, white growth, consisting of granular matter, fibres, cells, and cholesterine. Tubercle (?)	The cord was widened, but of natural colour and firmness	—	Death	Yellow tubercle of adrenals; other organs healthy, except a few old tubercular nodules, and pleuritic adhesions at both apices	Broadbent, Trans. of the Path. Soc. of London, vol. xiii, 1881, p. 248.
53	M. 38	Blow on lumbar spine	—	—	2 years	5 months	Pain (following blow) in sacrum and loins; later could not lie; complete motor paraplegia of lower extremities	Severe burning pain, first referred to sacrum and as shooting into legs; later felt on sitting down, and extended into ischial tuberosities. Condition improved shortly before death, so that he could lie down again	Complete motor paralysis of both legs; complete sensory paralysis of left leg; incomplete of right leg; paræsthesia; paralysis of bladder	—	—	—	—	—	There was found a "fontanelle" in the sacral region, which, on being opened. contained a thin fluid, which subsequently became purulent	—	Contained blood just before death	Both lower limbs severely œdematous	—	Within, and separate from, arachnoid and dura	Whole length of cauda equina	In site of filum terminale; especially extensive towards the left side	Yellow tubercle, multiple, but aggregated to one mass	Cord normal. Nerves of cauda involved (?)	—	Death	The laminæ and bodies of the lumbar vertebræ were carious. Nil else recorded	Fisher, Trans. of the Provincial Medical and Surgical Association, 1842, vol. x, and Schmidt, Jahrbücher, Bd. 39, p. 286.
54	F. 1½	—	—	Bad; 2 brothers died of tubercle, others of fits, of tetany, of marasmus	—	3 months	Illness began with cough and pain on movement	On movement evidently very severe	Complete paralysis, motor and sensory, of left lower limb, and apparently almost of left upper limb	Superficial plantar present on right, absent on left	—	Considerable; limbs remaining in flexion	—	General emaciation	No change recognisable	No reaction	—	—	—	In the cord	Length 10 mm., thickness 9 mm.	In left lateral column, opposite 8th and 7th dorsal vertebræ	Yellow tubercle mass, was both caseated and fibrous	Dorsal cord swollen and softened at level of 8—7 dorsal vertebræ for a distance of 19 mm., owing to presence of tumour on left half; right half pressed aside, individual columns still obvious	Treated for syphilis	Death	Right lung, small cavity at apex; bronchial glands caseous	Kohts, Gerhardt's Handbuch der Kinderkrankheiten, Bd. 5, 1880, p. 422.

No. of case.	Sex, age.	Alleged cause.	History.					Symptoms.												Tumour.					Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
			Personal.	Family.	Illness.			Pain.	Paraplegia, motor and sensory.	Reflexes.	Spasms, including clonus.	Rigidity.	Decubitus.	Nutritive changes.	Spine, physical examination.	Pupils.	Urine.	Vaso-motor changes.	Vomiting.	*a.* Relation to dura.	*b.* Size.	*c.* Position.	*d.* Nature.	*e.* Effect on cord.				
					a. Total duration.	*b.* Duration under observation.	*c.* Course of symptoms.																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Parasitic Growths :																										
55	M. 25	—	Intermittent fever when a child; nil else	—	5 months (?)	8 months (?)	Pain in left upper limb, thought to be consequence of getting wet through. The pain began in the left hand, spread thence (becoming worse) up to the forearm, upper arm, shoulder, and ultimately the clavicular region. Pain later came in right upper extremity, but was less marked. At same time felt pain at spine of 7th cervical vertebra. At this period also he had the cord sensation in the chest. 4 months after onset numbness and tickling in the left foot, which quickly spread up leg and thigh, the limb shortly becoming quite anæsthetic; then right lower limb also. Movement lost after sensation	2 months before death pain in left side, at right of 4th—7th rib, preventing sleep at night; powerful dragging pains in the left arm	Complete of lower limbs, save right great toe; slight movements; paralysis of bladder and rectum, commencing with the paralysis of sensation. Anæsthesia extended up to 7th rib. Pains in left upper limb replaced later by numbness; it then gradually became paralysed 2 months ante mort. Anæsthesia spread upwards. Later paralysis of motion and sensation in the upper limb	—	No spasms	—	Left heels, outer border of right foot, on chine-bone; this greatly increased, and led to pyæmic infection	General wasting of body	7th cervical vertebra painful on pressure or movement	Left small, contracted, constantly immobile; right normal	Normal till 3 months before death, then ammoniacal pus, &c.	Œdema in both lower limbs late; tache visible early in lower limbs	—	In pia mater, between dura and cord	(1) 5 cm. long vertically by 1·8. (2) 3·8 cm. long vertically by 1·1 cm.	(1) Immediately below cervical enlargement. (2) 7½ cm. lower. Both on left side of cord	Two echinococcus cysts, containing daughter cysts	Excess of cerebro-spinal fluid. Cyst No. 1 flattened, for 3·5 cm. by 1·8 cm., the cord on the posterior surface of the left side, so that towards the upper border of the depression the cord was almost divided, there being only a flattened strip of cord left a few mm. broad, and very soft. Vessels in neighbourhood of both cysts very vascular; very empty at points compressed. Cyst No. 2 also compressed the cord, and rendered it soft	—	Death	Caseous mass in apex of left lung, œdema of lung, bronchitis, pyelitis, cystitis	Bartels, Kiel Deutsches Archiv für klinische Medicin, Bd. v, 1869, p. 108.
56	F. 48	—	—	Mother had nervous twitchings over whole body (after nervous shock) for 7 years	1¼ years	1 year	Illness began with headache, staggering gait, clonus of knee, and trembling of hands	Severe pain later in the illness felt in loins and sacral region	Paresis of all four limbs; sensation normal; suffers from epileptiform attacks, accompanied sometimes with loss of consciousness, at other times not. Later paresis of bladder and rectum	—	All limbs frequently twitch, and remain extended or flexed	Marked	Excessive in late stages	—	—	—	—	—	—	Inside dura and arachnoid, scattered over cord, &c.	Numerous cysts, varying from a potato to a bean	Numbers in the arachnoid, covering the cauda equina. A few found in the cervical and upper dorsal regions. Numerous cysts in brain	Cysticercus	Appeared softened; doubtful, as decomposed	Blisters, Pot. Brom., arsenic, &c.	Death	Cysticerci in brain; nil else important	Westphal, Berliner klinische Wochenschrift, No. 43, 1865, p. 425.
		Syphilis :																										
57	F. 53	Syphilis	—	—	—	—	Illness began with numbness and anæsthesia over the right hip and along the crest of the ilium. Leg (right) began to get weak	—	*Motor* paresis right leg; later paralysis; later left leg, ditto; paralysis of bladder; complete paraplegia. (Secretion probably ?)	—	—	—	Probably	—	—	—	—	—	—	Within the dura, in the cord	Length ¾ inch. Size of nut	On right side of lumbar region, adherent to posterior root	Hard, opaque, yellow, amorphous	—	—	Death	Few gummata in liver and lungs	Wilks, Guy's Hosp. Reports, 3rd series, vol. ix, p. 50, 1863.
58	M. 22	—	—	—	1 year	—	Rapid progression	Very severe pains shooting from the sacrum into the legs	Complete motor (and sensory ?) paralysis	—	—	—	Present	—	—	—	Cystitis developed late	—	—	Between dura and cord	Small walnut	Posterior surface of cord, where the cauda equina begins	Not stated	Spinal cord was slightly flattened by the growth, but otherwise quite healthy	—	Death	Nothing noted	Leyden, Klinik der Rückenmarks Krankheiten, Band i, 1874, p. 468.